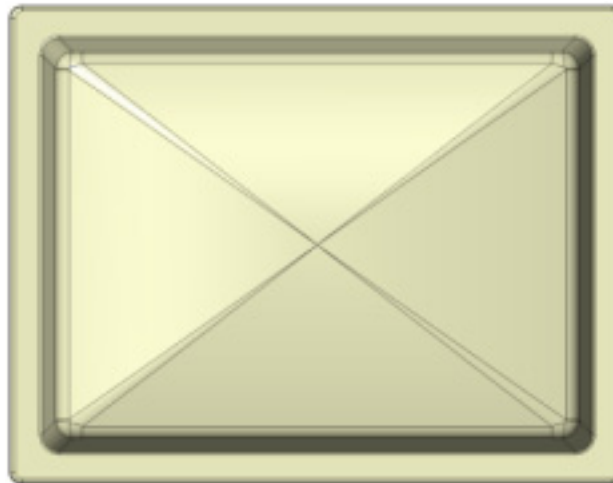




Wireless to the MAX



PacketMax 120/320



Installation and Operation User Manual ■ ■

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Regulatory Information

CE Notice

Declaration of Conformity

Aperto Networks Inc. of 598 Gibraltar Drive, Milpitas CA 95037, USA, declare under our sole responsibility that the following product models, PM120/320-3G and PM120/320-5G, to which this declaration relates, are in conformity with the following standards and/or other normative documents.

- EN 301 753
- EN 301 489
- EN 60950

We hereby declare that all essential radio test suites have been carried out and that the above named product is in conformity to all the essential requirements of Directive 1999/5/EC.

The conformity assessment procedure referred to in Article 10 and detailed in Annex [III] or [IV] of Directive 1999/5/EC has been followed.



UL Information



CAUTION: For the CATV system, the CATV installer should install in accordance with Article 820-40 of the NEC which provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building, as close as possible to the point of cable entry as practical.



CAUTION: The external exposed (outdoor) run of the cables, from the exit of the building to the antenna/radio assembly, should be less than 140ft, while the total cable run is as described in this manual.



CAUTION: For Model PM 120/320, the Power Over Ethernet box is intended to be installed indoor only and the Radio/Antenna is intended to be installed outdoors.

Waste Electrical and Electronic Equipment (WEEE) Directive Compliance

Aperto Network products sold within the European Union (EU) are subject to the requirements of the Waste Electrical and Electronic Equipment (WEEE) Directive; as implemented by national legislation in each EU country. The objective of the Directive is to reduce the environmental impacts of WEEE by promoting re-use and recycling, as an alternative to disposal.

From 13 August 2005, product placed on the EU market is required to be marked with the symbol shown below. This symbol indicates that end-of-life electronic equipment generated within the EU should not be mixed with other types of waste or placed in the general waste stream; but should be segregated for the purpose of re-use or recycling.

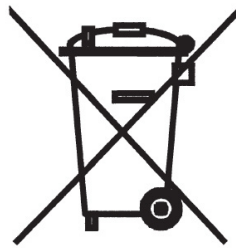


Table Of Contents

Scope of This Manual	-i
Conventions Used in This Manual	-i
Intended Audience for this Manual	-ii
General Cautions and Warnings	-ii
List of References	-iv

Chapter 1. Overview Of PacketMAX 120/320 Subscriber Station

PacketMAX 120/320 Features	1-2
PM 120/320 Hardware Features	1-2
PM 120/320 Software Features	1-2
Bridge Mode	1-2
VLAN Mode	1-2
Point-to-Point Mode	1-3
Management, Configuration and Diagnostic Functions	1-3
Upgrades	1-4
SS Configuration	1-4
MIB	1-4
Event Reporting	1-4
3 DES Encryption	1-5
Certificates and Management	1-6
IP Filtering	1-7
Automatic Frequency Scanning (AFS)	1-8
PM 120/320 Package Content	1-9
Components of PM 120/320	1-10
PacketMax 120/320 Outdoor Unit (ODU)	1-10
PacketMax Indoor Unit - PoE (IDU)	1-10

Chapter 2. Installation of PacketMAX 120/320 Subscriber Station

Installation Requirements	2-2
Cables and Connector Requirements	2-2
Additional Items Required	2-3
Before Installation	2-3
Installation Process	2-4
Installing the Ethernet Cable and Boot Cover.	2-4
Mounting PM 120/320: Pole Mounting	2-6
Positioning the Outdoor Unit.	2-7
Grounding the Outdoor Unit (Radio/Antenna)	2-8
Connecting the Outdoor Unit to the Power Over Ethernet	2-11
Configure the PM 120/320 Using the HTTP Configurator	2-12
Align the PM 120/320 ODU	2-14
Rebooting the Subscriber Station and Connecting to the PacketMAX Network	2-15

Chapter 3. Configuring PacketMAX 120/320 Using Configurator

PacketMAX 120/320 Configurator	3-2
Logging in to the Configurator	3-2
Understanding the Pages in the Configurator	3-3
Specifying Wireless Settings	3-4
Automatic Frequency Scanning (AFS)	3-6
Specifying Network Setup Settings	3-7
Viewing Status Information	3-8
Information Page	3-9
Wireless Information Page	3-10
System Information Page	3-12
Statistics Information Page	3-13
ARP Information Page	3-15
System Log	3-16
Configuring Administrative Settings	3-17
Returning to Factory Default Settings	3-18
Rebooting the PM 120/320 Unit	3-18
Changing the Device Name and Location	3-19
Enabling or Disabling Web, SSH, and Telnet Access	3-19
Enabling or Disabling the Status LEDs	3-20
Changing Log In Settings	3-20
Throughput Test	3-20
Upgrading Firmware	3-22

Appendix A. Specifications

General Specifications	A-1
Models	A-1
Interfaces	A-1
Power requirements	A-1
RF and Antenna Specifications	A-2
PM 120 General Specifications	A-2
Receiver Threshold Specifications	A-3
Performance and capacities	A-4
Mechanical Specifications	A-4
Environmental Specifications	A-5
Mounting and Brackets	A-5
Regulatory Standards	A-5

Appendix B. Event Reporting

PacketMax 120/320	B-1
-------------------------	-----

Appendix C. Cables, Spares and Accessories

PacketMax 120/320 CPEs, Cables and Spares	C-1
PacketMax 120/320 CPEs	C-2

PacketMax 120 Cables	C-2
PacketMAX 120/320 Spares	C-3

Appendix D. Virtual Local Area Network

Bridge and VLAN Mode	D-2
Out of band Management with Management VLAN	D-2
Inband Management with Management VLAN	D-3
VLAN Classifiers	D-4
VLAN Application Example	D-5
Looping Prevention	D-6
Behavior of SS VLAN	D-6

Appendix E. Troubleshooting

Troubleshooting Issues and Tips	F-1
---------------------------------------	-----

Appendix F. LIMITED EQUIPMENT WARRANTY (“Agreement”)

WARRANTY COVERAGE	G-1
REMEDIES	G-2
LIMITED LIABILITY	G-3



Preface

Preface

This manual is part of the documentation for the PacketMax broadband wireless system for delivering high-speed subscriber services.

Scope of This Manual

This manual documents the installation and operation of the PacketMax 120/320 Series subscriber equipment.

This manual provides the following information:

- **Chapter 1 Overview of Subscriber Station:** Provides an overview of the Aperto Subscriber Station, its components, and functions.
- **Chapter 2 Installation of Subscriber Station:** Provides step-by-step procedure for installing the Aperto Subscriber Station.
- **Chapter 3 Configuring PM120/320 Using Configurator:** Walks you through the steps of configuring PacketMAX 120/320 subscriber stations using the HTTP Interface.
- **Appendixes:** Provide additional information on System Specifications, Events and Alarms, Cables, Spares, and Accessories, VLAN, and Troubleshooting tips.

Conventions Used in This Manual

PacketMax manuals represent special kinds of text as follows:

- File names and URLs are represented in italics, with variables described inside angle brackets. For example, if the URL *http://<IP address>/BS.htm* is referenced, you will replace the variable *<IP address>* with the appropriate real IP address.

- Management interface text is represented in a bold font: for example, the **Generate Config File** button.
- Labels on equipment are represented in a bold font: for example, the **Control connector**.



WARNING: This format is used to indicate the possibility of personal injury or damage to equipment.



CAUTION: This format is used to indicate the possibility of system or equipment operation problems.



NOTE: Items of special importance will be marked by a pointing-hand icon, as this paragraph is.

For conceptual discussions, PacketMax 120/320 is used interchangeably with SS or Subscriber Stations in many places of this user manual. Similarly, PacketMax 5000 and PM 3000 is used interchangeably with BS or Base Station in many places of this user manual.

Further, Subscriber Station and Subscriber Equipment have been used interchangeably.

Intended Audience for this Manual

This manual is intended primarily for subscriber equipment installers. It also presents information of use to subscribers, including a discussion of tools used for configuration.

Installation of radio equipment involves numerous factors requiring considerable expertise. It is assumed that equipment installers are professionals with a full understanding of the principles, standard practices and procedures of cell site installation, with all relevant safety requirements, and with applicable local building codes.

General Cautions and Warnings

Observe the following when installing or operating any PacketMax System components.

Carefully follow all local building and electrical codes, especially the latest revision of the National Electrical Code (NEC) and standard safety procedures for installing and working with this type of equipment. Improper procedures or installation can result in damage to the equipment or the building, and injury or death. If you

are not sure about whether the installation follows these codes, contact a licensed building inspector or electrician in the area for assistance.

Always use quality components—including cables, connectors, mounts, etc.—specifically rated for your particular environmental conditions and system performance requirements.

Always use appropriate tools, and follow the instructions of the tool manufacturers.

All outdoor installation, including equipment mounting and cabling, should be performed by trained microwave radio technicians familiar with usual and customary practices and procedures.

Take extreme care to avoid contacting any overhead power lines, lights, and power circuits while you are installing the Outdoor Unit. Contact with any of these objects could cause injury or death. Do not install the Outdoor Unit near power lines.

Make sure that the outdoor radio/antenna is grounded in accordance with local, state, federal, and National Electrical Code (NEC) requirements. Pay special attention to NEC sections 810 and 820. See the instructions in Chapter 4 of this manual.

For the PacketMax 120 Series Indoor Unit, use an outlet that contains surge protection and ground fault protection, or use a surge protection device. This will protect the Indoor Unit and equipment connected to it from damage resulting from AC current surges, lightning, etc. For complete protection, all connections to the Indoor Unit (i.e., from radio/antenna and PC/hub) should be connected to a surge protection device. To ensure the best signal, use surge protectors designed for the specific application.

RF Exposure Guidelines

In order to comply with FCC and Industry Canada requirements for maximum RF exposure levels to persons, the antenna must be mounted in such a way that dur-

ing operation, a minimum separation distance of 21 cm is maintained between the antenna and all persons.

Prohibition against Unauthorized Modifications

The user is cautioned that changes or modifications not expressly approved by Aperto Networks could void the user's authority to operate the equipment.

PM120/320-5G units sold in the United States can only be used in the FCC specified band of 5.725 to 5.850 GHz.

PM120/320-3G units sold in the United States can only be used in the FCC specified band of 3.650 to 3.675GHz.

Because Aperto Networks cannot be responsible for improper installation or use of its equipment, failure to follow these and other published cautions and warnings may void your equipment warranty.

List of References

WaveCenter EMS Pro User Manual

PacketMax 5000 Installation and Operation User Manual

PacketMax 3000 Installation and Operation User Manual

1

Overview Of PacketMAX 120/320 Subscriber Station

As part of Aperto Networks' PacketMax™ Broadband Multiservice Wireless Access System, the PacketMax 120/320 Series Subscriber Station delivers high-speed, always-on Internet access to small and medium-sized businesses, small offices/home offices (SOHO), and residences. The PacketMax System can be deployed in the standard frequency bands, licensed or unlicensed, for wireless broadband networking. For the PacketMAX 120/320 System specifications, see General Specifications.

This Chapter covers the following topics:

- ◆ [PacketMAX 120/320 Features](#)
- ◆ [PM 120/320 Package Content](#)
- ◆ [Components of PM 120/320](#)
- ◆ [VLAN Mode](#)
- ◆ [Management, Configuration and Diagnostic Functions](#)



1.1 PacketMAX 120/320 Features

The PacketMAX 120/320 is designed for quick installation. The following list summarizes the key features of PM 120/320.

1.1.1 PM 120/320 Hardware Features

- ❖ Power-over-Ethernet (PoE) capabilities allow data and power to be supplied to the unit using a single Ethernet cable.
- ❖ Includes an external or embedded antenna with multiple antenna gain options.
- ❖ External signal strength LEDs allow the antenna to be aligned for optimal received signal strength from the base station, without having to use a computer to log in to the unit

1.1.2 PM 120/320 Software Features

- ❖ Standards-Based: Compliant with IEEE 802.16-2004 for communication with WiMAX base stations that support this standard.
- ❖ Extensive Frequency Bands Coverage: Operates in licensed and unlicensed bands including 3.3 GHz, 3.4GHz, 3.65GHz, 5.1GHz, 5.4GHz, 5.8GHz.
- ❖ Industry's leading Quality of Service: Supports configurable QoS on UL and DL, including UGS support for latency-sensitive applications.
- ❖ Popular Channel Bandwidths supported: Supports 3.5, 5 and 7 MHz.
- ❖ Network Stack: Both bridge and VLAN modes supported. IP filtering for Layer 2, 3 and 4 supported.
- ❖ Security: X.509/3DES encryption mode supported.
- ❖ Management: HTTP Interface for configuration; Support for Secondary Management using WaveCenter EMS Pro.

1.2 Bridge Mode

The default setting of the PM 120/320 Subscriber Stations is Bridge mode.

1.3 VLAN Mode

The operation of the PM 120/320 in VLAN mode has been discussed in Virtual Local Area Network section. Please refer to Virtual Local Area Network, for information on SS in VLAN Mode and different user scenario examples.

1.4 Point-to-Point Mode

The PacketMAX 5000/3000 Base Stations in combination with PacketMAX 320 Subscriber Stations provide high-speed, cost-effective links for point-to-point applications. With unprecedented interference resilience and minimal spectrum usage, they are ideal for such applications as high-speed backhaul of Wi-Fi hotspot networks, higher-capacity alternatives to T1/E1 connections, and building-to-building connections in the enterprise environments.

Features of Point-to-Point applications include:

- ❖ Support for 3.3, 3.5, 3.65, and 5.8 GHz frequency bands
- ❖ High interference immunity
- ❖ Exceptional wireless range (up to approximately 35 to 50 miles/ 55 to 80 km, depending on the frequency band)
- ❖ Outdoor radio units with connectorized output for high-gain antennas to extend the range of the wireless link.
- ❖ Synchronization between units
- ❖ Management via SNMP-based Element Management System.

Point-to-Point Mode allows you to increase the number of supported hosts up to 7500 (from 250 supported in PM 320). You can enable or disable the Point-to-Point Mode from the SS Configuration screen in the WaveCenter EMS Pro.

Point-to-point mode is supported only for PM 320.

1.5 Management, Configuration and Diagnostic Functions

The PacketMax 120/320 includes a number of features which provide management, configuration, and diagnostic functions. They range from back-panel LEDs to HTTP Interface and include:

- ❖ LEDs — LED indicators on the back-panel of the ODU show status of the LAN, wireless interfaces as well as power to the unit, and RSSI status.
- ❖ HTTP Interface— This utility initializes newly-installed subscriber equipment and displays the system parameters.
- ❖ SNMP Agent — Each PacketMax 120/320 includes an SNMP agent which can be accessed via a standard SNMP manager, either directly or through the Base Station Unit's proxy agent.



1.5.1 Upgrades

The bulk upgrade feature of EMS allows the users to upgrade the BS/SS in batches efficiently (multiple CPEs together). You can also upgrade the Subscriber Station using the HTTP Interface.

1.5.2 SS Configuration

SS configuration can be done in Secondary Management mode using the WaveCenter EMS Pro. When you configure the CPE using HTTP Interface, ensure that Secondary Management (Default) option is selected.

1.5.3 MIB

Each PacketMax 120/320 includes a SNMP agent supporting the following MIBs:

- ❖ MIB II (RFC 1213)
- ❖ Aperto private MIB
- ❖ Wimax-IF-MIB (objects for 802.16 based SS and BS)

The complete MIBs are provided on the PacketMax CD-ROM.

SNMP can be used to read configuration, status, and performance data from Subscriber Units. In addition, SNMP can be used to change some configuration parameters (those which can be changed via the Configuration Manager in EMS), and to upload the configuration changes to the TFTP server (if the TFTP server is configured to accept uploads).

The SNMP agents support trap reporting. Trap-reporting parameters can be specified via the Configuration Manager as well as via SNMP.

1.5.4 Event Reporting

PacketMax 120/320 Series Subscriber Units offer several means of reporting subscriber equipment events:

- ❖ SNMP traps — The Subscriber Station's SNMP agent supports trap reporting. Trap-reporting parameters can be specified via the EMS (WaveCenter Configuration Manager), or SNMP.
- ❖ Syslog — The Subscriber Station supports logging of event messages to a designated server according to the Syslog protocol. If Syslog is employed, the Syslog server must be identified in the Subscriber Station configuration file created using the WaveCenter Configuration Manager.



NOTE: *Use of Syslog is strongly recommended as a means of providing a record of system events for performance management and troubleshooting.*





1.5.5 3 DES Encryption

Security is a required feature in the current network, to ensure that the Base Station and Subscriber Station communicate with each other. An encryption scheme is used to secure the BS and SS communication channel by encrypting the data between the two.

The Encryption procedure is as follows:

1. At first, the SS initiates the authorization process and sends message to the BS indicating that it is capable of encryption.
2. The BS authorizes the SS by verifying the device and Vendor Certificate of the SS during the Privacy Key Management (PKM) Message Exchange.
3. An Authorization Key (AK) is used to decrypt the Traffic Encryption Keys (TEKs) using PKM protocol. The AK is periodically refreshed and is encrypted using 3DES.
4. In the BS, the TEKs are generated and send to SS using the 3DES encryption format. The SS decrypts these TEKs using a Key Encryption Key (KEK) generated from the AK. If the BS encrypts the TEK using the RSA Public Key of SS, then the SS decrypts it using its Private Key.
5. The TEKs are used for encrypting data on different Service Flows (SF) between the BS and SS.
6. All the Service Flows for one SS will have the same key in both upstream and downstream.



NOTE: To enable encryption on every service flow, please refer to the WaveCenter EMS User Manual.

7. The traffic between the BS and SS can now be encrypted/decrypted using the TEK keys.
8. If the CPE fails authentication, the CPE can re-try authentication.



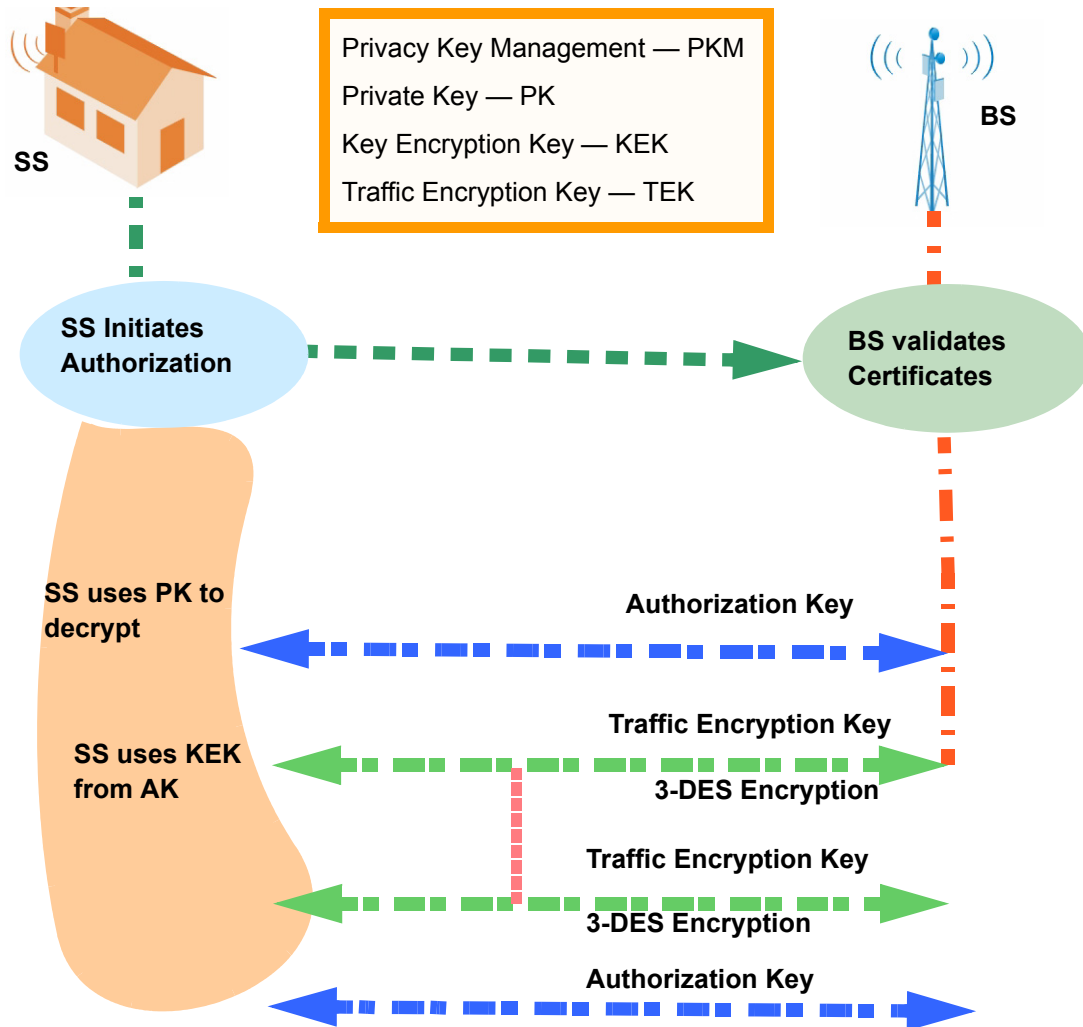


Figure 1-1 3-DES Encryption



NOTE: TEK is encrypted using KEK derived from Authorization key and 3DES Algorithm, while data is encrypted using TEK and DES Algorithm.

1.5.6 Certificates and Management

WiMax forum prescribes X.509 based digital-certificate for authorization process, which is part of the negotiation process as described in the above section. The certificates are used to strengthen the security process.

The Aperto WiMax Root Certificate, is a Self-Signed certificate issued by the Aperto Certifying Authority (CA). The CA is stored in the BS. The X.509 certificates are injected into the base station devices at manufacturing time and can later be upgraded from the EMS.

The Root Certificate is the same across all Base Stations and shall be available on MSC, as the Certificate Verification happens on MSC. In the case, when primary and redundant MSCs are installed, the Certificates need to be available on both the MSC

Cards (Primary and Redundant). Currently we are upgrading the Primary MSC with the Wimax Root Certificate during the Upgrade Process.

1.5.6.1 Certificate Upgrades

Some important factors that users should take a note of, for certificate upgrades are:

- ❖ In a redundant BS configuration, the certificates need to be installed using the LAN upgrade tool.
- ❖ Once the user has a device which is certified, the LAN upgrade and Bulk Upgrade tool has to be used to upgrade the certificates.

1.5.7 IP Filtering

IP Filtering is supported on the following MSC interfaces:

- Management Interface (FEI)
- Wireless Interfaces
- Backhaul interface

IP Filtering is supported on the following SS interfaces:

- Wireless Interface (wscd)
- SS LAN interface

On each interface, a maximum of 64 rules are allowed. Hence, the valid values for the rule index field is 1 to 64.

Because an incoming packet can match more than one rule in the filtering table, a priority field is used to determine which is the matching rule. While configuring a filtering rule, the user is expected to give a priority value for the rule. The priority value can be 0 to 255, where 255 represents the highest priority.

The rules are ordered based on priority and the filtering lookup is done on this list. The result specified in “first matching rule” is taken as the filtering lookup result.

The matched rule dictates the action to be taken on the packet. The possible actions are as follows:

- Allow: Allow the packet to go through subsequent operations such as forwarding lookup.
- Deny: Drop the packet.

If the filtering rule matches the incoming packet, the default filtering action is considered for that packet. The default filtering action is “Allow”.

It is not possible to change the default action dynamically. However, it can be modified at compile time.

For each filtering rule, a counter is supported. This 32-bit counter indicates the number of packets that have matched the specified rule.

A user must specify a rule name while he/she creates the rule. Also, the rule name must be unique within the interface. That is, no two rules on same interface can have the same rule name. A rule name can have a maximum of 31 characters.

The following fields are supported in packet filtering:

- Layer 2 Header Fields



- Ethernet source address
- Ethernet destination address
- Ethertype
- User priority
- VLAN ID
- Layer 3 Header Fields
 - IP source address
 - IP destination address
 - IP protocol type
 - IP DSCP (TOS)
- Layer 4 Header Fields
 - ICMP Type
 - ICMP Code
 - TCP and UDP source and destination ports

For information on IP Filter configuration, see the IP Filter Configuration section in Chapter 4 Configuration of PacketMAX Devices.

1.5.8 Automatic Frequency Scanning (AFS)

PM 120/320 can be configured through the HTTP Configurator to scan up to ten frequencies to look for an authorized WiMax Base Station. When the AFS mode is enabled in the HTTP Configurator, PM 120/320 scans frequency list provided in the AFS Scanning Frequency field and measures the signal level (SNR) of each approved Base Station. After scanning, PM 120/320 synchronizes the scanned Base Stations with the highest signal level. For information on enabling AFS, see the section 3.2.1 Automatic Frequency Scanning (AFS).



1.6 PM 120/320 Package Content

- ❖ PM 120 or PM 320 CPE Radio (ODU) with either an integrated antenna or Type-N connector
- ❖ POE adapter x 1
- ❖ Ethernet boot cover x 1
- ❖ Gasket x 1
- ❖ AC/DC universal power adapter x 1
- ❖ Cat5 indoor Ethernet Cable (6 ft/150 cm)
- ❖ Mounting Kit containing :
 - Mounting Bracket
 - U-bolt w/ 2 nuts x 1
 - Strain relief x 1
 - Keps nuts x 8
- ❖ Quick Installation Guide

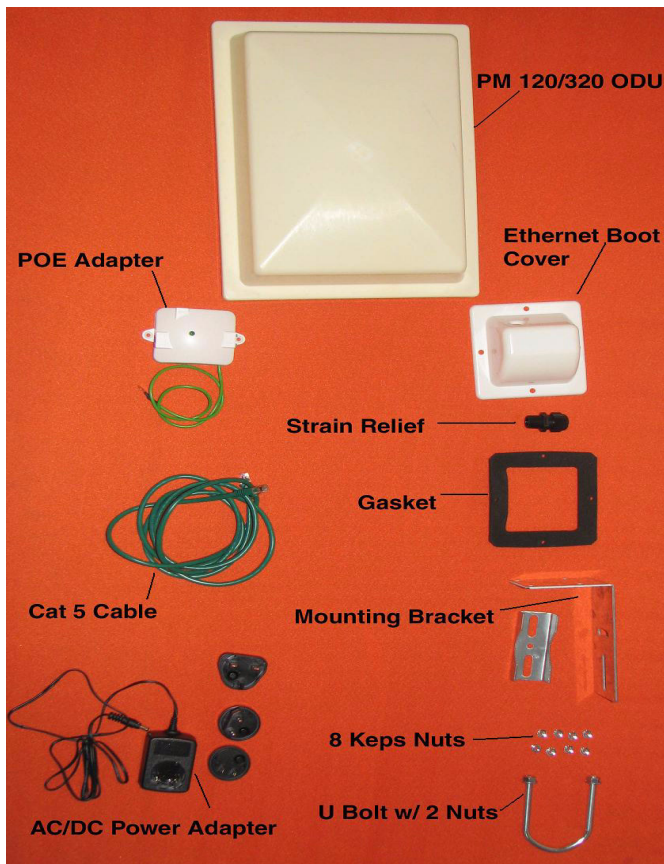


Figure 1-2 Package Contents

1.7 Components of PM 120/320

PacketMax 120/320 Series subscriber stations consists of an Outdoor Unit (radio/ antenna), and an IDU, Power over Ethernet (PoE).

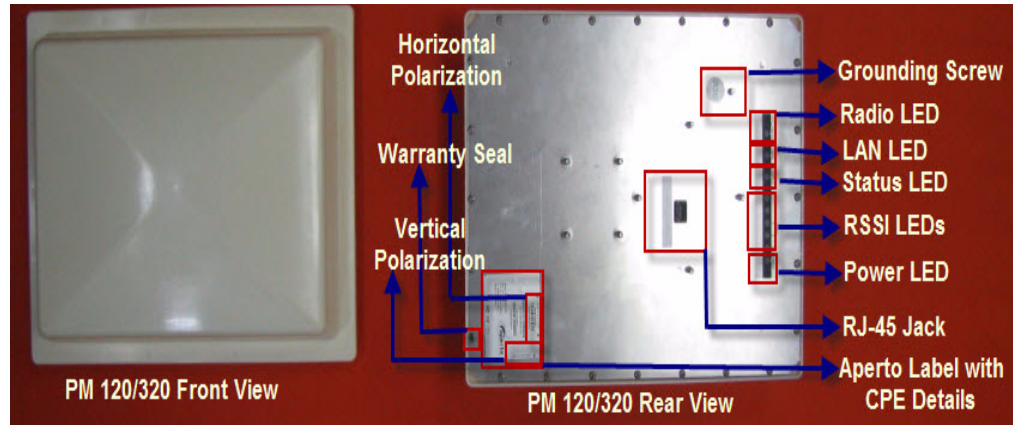


Figure 1-3 PacketMax 120/320 ODU

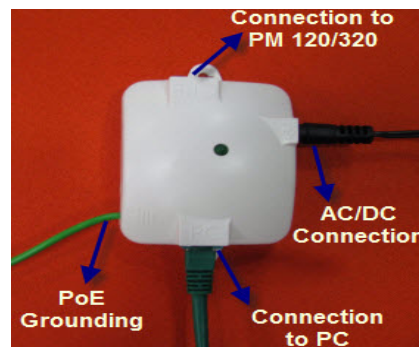


Figure 1-4 PacketMax 120/320 PoE

1.7.1 PacketMax 120/320 Outdoor Unit (ODU)

The outdoor unit integrates all communication, networking, RF and antenna functions. The internal antenna supports vertical and horizontal polarizations. PacketMax 120/320 ODU connects to the user's Local Area Network and power source (Power Over Ethernet block) through a single CAT 5E cable (RJ-45 connector).

1.7.2 PacketMax Indoor Unit - PoE (IDU)

The PacketMax 120/320 IDU is a PoE powered using an AC/DC converter. Being a small, free-standing unit, it can be placed anywhere within the subscriber's premises. The Indoor Unit has two interfaces, one connecting to the Outdoor Unit and the other connecting to subscriber's LAN.



The IDU must meet the following basic requirements:

- ❖ The unit must have access to AC power.
- ❖ The cable connecting the IDU to the Outdoor Unit can be up to 90 m.
- ❖ The PoE must be upright, with adequate air flow around it.

The IDU (Power Over Ethernet) features consists the following:

- ❖ AC/DC Universal Adapter that plugs into a standard AC wall plug (100-240 VAC).
- ❖ 10/100Base-T Ethernet port used to carry signal and power to ODU.
- ❖ Auto-sensing 10/100 Base-T Ethernet port for customer network equipment.

The IDU provides a visual indication of the power status.



2

Installation of PacketMAX 120/320 Subscriber Station

This chapter outlines the basic procedure for installing the PacketMax 120/320 Series Subscriber Station. It identifies the minimal requirements for getting the equipment up and running.

NOTE: *It is assumed that configuration, using DHCP and WaveCenter™ Configuration Manager or through the HTTP Interface, has been performed as described in the “Configuring an SS” section in Chapter 4 Configuration of PacketMAX Devices of the WaveCenter Element Management System (EMS) User Manual.*



WARNING: Outdoor installation procedures should be performed by qualified professionals following all safety and other requirements and acting in accordance with standard practices and procedures. Failure to meet safety requirements and/or non-standard practices and procedures could result in personal injury and/or damage to equipment.

This chapter covers the following topics:

- ◆ [Installation Requirements](#)
- ◆ [Installation Process](#)

2.1 Installation Requirements

2.1.1 Cables and Connector Requirements

You will also need the following cables and connectors:

- ❖ Shielded CAT 5E cable (outdoor rated), long enough to run between Indoor and Outdoor Units, and two shielded RJ45 male connectors
- ❖ Ethernet cable with RJ45 male connectors (straight-through for connection to hub, or crossover for connection to computer)

Table 2-1 **Subscriber Site Cable Requirements**

Connection	Qty	Cable Type	Max. Length	Connectors
Radio Control	1	Shielded CAT 5E, Outdoor-rated	50 m (100 ft)	RJ45 male
	1	Shielded CAT 5E, Outdoor-rated	100 m (330 ft)	RJ45 male

Please refer to the Cable Specs for further details under section C.1.2, in Appendix C.

2.1.2 Additional Items Required

To install your PacketMAX 120/320 Series Subscriber Station, you will need the following tools:

- ❖ Drill (for cable entry through walls, etc.)
- ❖ Wrench (1/2", 3/4", & 3/8")
- ❖ Cat 5E cable stripper x 1
- ❖ Cat 5E cable (to connect the radio to the POE adapter)
- ❖ Cable Tester (capable of testing 10Base-T and EIA/TIA 568B)
- ❖ RJ-45 patch cable
- ❖ RJ-45 crimper x 1
- ❖ RJ-45 connectors x 4
- ❖ #6 green grounding wire

2.1.3 Before Installation

1. Make sure that the EMS software application is able to communicate with the PM5000 or PM3000.



CAUTION: Make sure that the Indoor Unit is installed in a room with temperature between 32 and 104 °F (0 and 40 °C) and the humidity between 10% and 90% noncondensing.

2. Identify location for mounting the PM 120 ODU: In most cases, the unit should be pointed at the base station with the least possible obstruction. For optimal wireless channel performance, it is advantageous to locate the Outdoor Unit (radio/antenna) where it has the least-obstructed path to the base station antenna. If a line-of-site path is available, locate the Outdoor Unit where the path is least likely to be affected by such obstructions as blowing branches, seasonally changing foliage, etc. If a clear line-of-site path is not available, choose a path that minimizes obstructions.

Other factors to consider when choosing a location for the Outdoor Unit include:

- ❖ Distance to the Indoor Unit — Locate the Outdoor Unit so that cables to the Indoor Unit will be within the maximum cable length limit. See Appendix E for cable details.
 - ❖ Cable routing — Consider how cables from the Outdoor Unit cables will enter the building.
 - ❖ Accessibility — If possible, choose a location that is relatively accessible, which will simplify installation and any adjustment or repair that might be necessary in the future.
3. Mounting method — The antenna/receiver includes an adjustable bracket for mounting the unit on a pole. For other mounting options (under an eave or on a chimney, for example), mounting hardware may be adapted as desired. Any alternate mounting method should allow adequate adjusting of the antenna direction, both horizontally and vertically.

4. Temperature Range: The optimal performance for the ODU can be achieved between -40 degree C to 55 degree C.

2.1.3.1 Safety Requirements

- ❖ Outdoor installation procedures should be performed by qualified professionals following all safety and other requirements and acting in accordance with standard practices and procedures. Performance of non-standard practices and procedures or failure to meet safety requirements could result in personal injury and/or damage to equipment.
- ❖ Lightning protection is recommended for subscriber equipment. Provide a service loop for the cable.
- ❖ Lightning damage is not covered by the product warranty.



WARNING: Always power OFF the PM 120/320 IDU before connecting or disconnecting the PM 120/320 ODU.

2.2 Installation Process

2.2.1 Installing the Ethernet Cable and Boot Cover.

1. Insert the strain relief, without the cap nut, into the port opening of the boot cover, as shown below:



Figure 2-1 Inserting Strain Relief

2. Put the cap nut back over the strain relief and insert the CAT 5E cable through it. Wire the cable following the EIA/TIA T568B standard, and attach the RJ-45 connectors to each end of the cable:



Figure 2-2 **Inserting CAT 5E Cable**

NOTE: Aperto highly recommends that the CAT 5E cable be verified using a cable tester before connection and power-up.

NOTE: To connect the Radio to the POE, you must use an outdoor-rated UV protected CAT 5E cable not to exceed 90 meters. Aperto recommends that you weather-seal the Radio cable connector and the antennae types connector (if present).

3. Place the gasket over the 4 studs around the port of the radio. Flatten the gasket ensuring there are no gaps, as shown below:

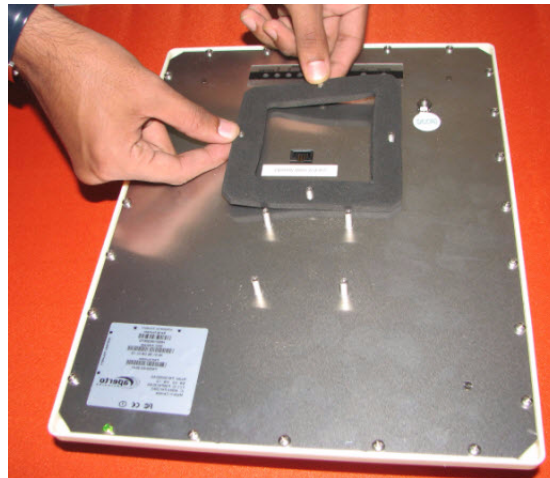


Figure 2-3 **Fixing Gasket**

4. Plug the CAT 5E cable inserted in the boot cover into the port. Remember to place the boot cover according to the desired polarization, so that the strain relief faces the ground, as shown below:

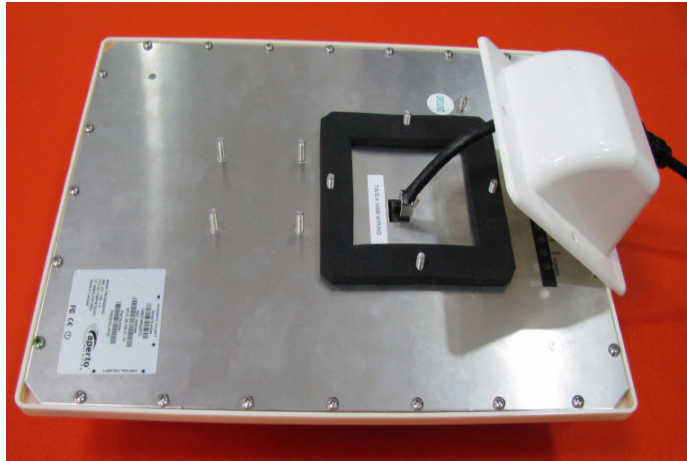


Figure 2-4 **Plugging the CAT 5E Cable**

5. Fit the boot cover over the 4 studs and the gasket. Secure with 4 keps nuts. Tighten with a 3/8" wrench until the gasket is at least 50% compressed.

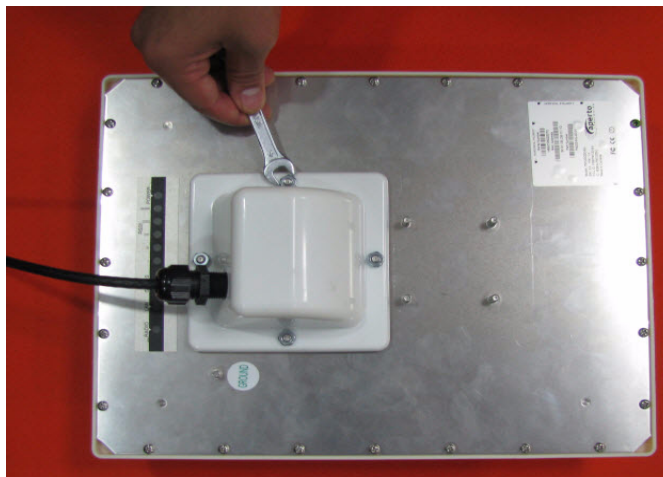


Figure 2-5 **Fixing Boot Cover**

6. Make sure the cap nut of the strain relief is tightened properly to ensure a weather-proof seal.



NOTE: For N-Type ODU, connect the external antenna to the N-Type connector.

2.2.2 Mounting PM 120/320: Pole Mounting

1. For Pole Mounting, attach the mounting bracket to the pole using the U-bolt. Secure the U-bolt with the lock washers and the nuts. Align if necessary, and

then tighten the nuts enough to prevent any movement. The bracket can accommodate pole diameters between 1.0 to 3.0 inches.

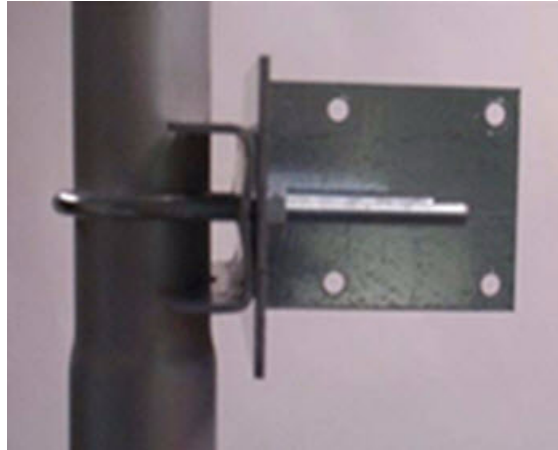


Figure 2-6 Pole Mounting

2. Fit the radio to the mounting bracket. Secure the radio with keps nuts.



Figure 2-7 Fixing ODU to the Mounting Bracket

2.2.3 Positioning the Outdoor Unit.

To achieve correct polarization, it is not possible to switch polarization using software. This can be done only by making physical changes to the subscriber station installation.

2.2.3.1 Vertical Polarization

Under normal circumstances the Subscriber station will be installed in a vertical polarization format. The orientation of the PM 120/320 should be such that the CAT 5E

cable connection is located at the bottom of the PM 120/320 as can be seen in Figure 2-8.

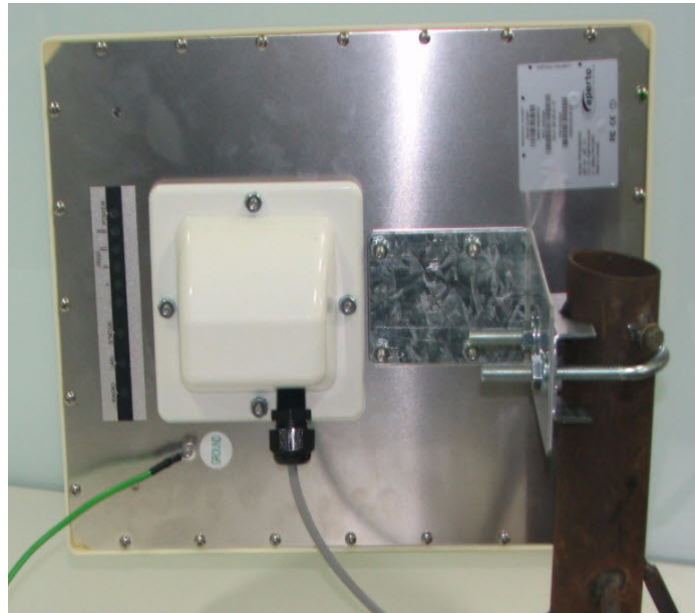


Figure 2-8 *PM120/320 installed in vertical polarization (Default)*

2.2.3.2 Horizontal Polarization

As the PM 120/320 only has one antenna array, in order to use horizontal polarization, it must be turned through 90 degrees so that the antenna array can receive RF signals that have been transmitted in a horizontal polarization. This can be achieved when attaching the pole mounting kit so that the orientation is that the CAT 5E cables are attached at the side of the PM 120/320. While PM 120/320 is in horizontal polarization, then all the weather protection precautions must be taken.

2.2.3.3 Reducing strain

No strain should be put onto the RJ45 connector of the SS otherwise it is possible that the connection between IDU and ODU is intermittent or, in extreme cases, damage to the RJ45 connector may occur. To ensure that this does not happen, a loop in the cable should be introduced so as to reduce any chance of inflicting pressure onto the connectors.

2.2.4 Grounding the Outdoor Unit (Radio/Antenna)

Grounding of the outdoor radio/antenna is an essential part of the installation process.



WARNING: Lightning protection is recommended for subscriber equipment. Instructions and an example are contained in the document titled *Surge Protection for PacketMax Products*, included on the PacketMax CD that accompanies the equipment. (If the CD or document

were not provided, contact Aperto Customer Service.) Lightning damage is not covered by the product warranty.

To properly ground the Outdoor Unit:

1. Locate the grounding lug on the ODU, as illustrated in Figure 2-9. The Grounding lug is located on the back panel of the outdoor unit.
2. Provide a proper grounding conductor (NEC Section 810-21) long enough to reach from the Outdoor Unit to the earth ground.
3. Crimp one end of a grounding cable to the suitable cable lug.
4. Connect the cable lug of the grounding cable to the grounding screw and tighten the grounding screw firmly.
5. Route the other end of the grounding cable to a good ground (earth or building) Connection. See Figure 2-10. Connect the AWG #6 grounding wire and route to the central building ground, as shown in Figure 2-11
6. Connect the AWG #6 grounding wire and route to the grounding Bar.



NOTE: *If you install a grounding electrode separate from the power service grounding electrode system, connect the separate electrode to the grounding system in accordance with the National Electrical Code (NEC) and local electrical codes.*



Figure 2-9 Location of Grounding Lug on Outdoor Unit (Radio/Antenna)

Refer to the table below for the grounding wire specification.



NOTE: *Please do not directly connect to the lighting rod.*

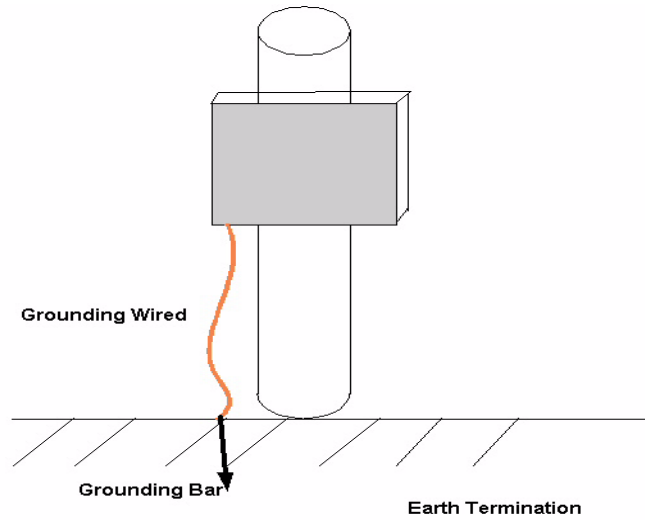


Figure 2-10 **Earth Grounding**

Table 2-B **Grounding Wire Specifications**

AWG unit (mm)		Max length of 0.25 ohm
AWG10	2.588	65.53m
AWG8	3.264	104.24m
AWG6	4.166	141.43m
AWG4	5.189	256.03m

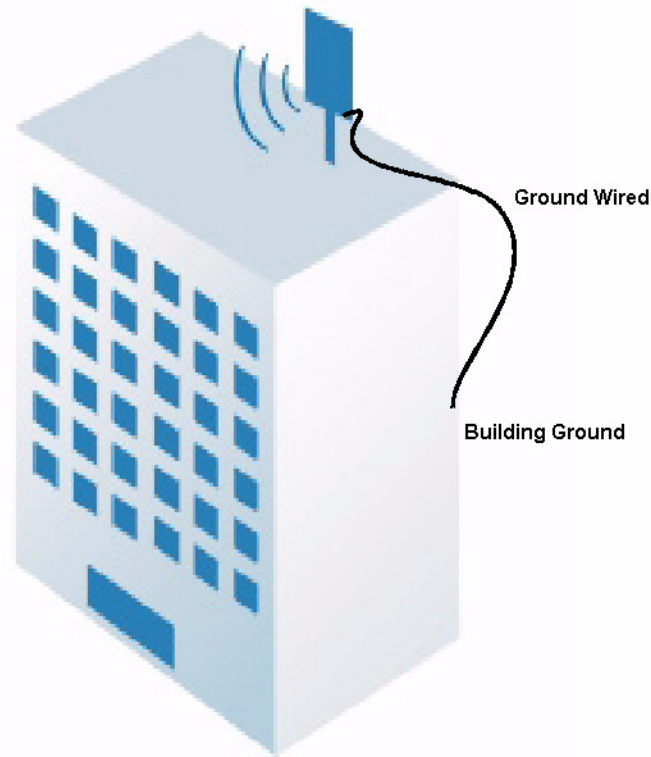


Figure 2-11 Building Grounding

2.2.5 Connecting the Outdoor Unit to the Power Over Ethernet

The PoE cable transports ethernet data and power and is a 1P67 compliant, weatherproof CAT 5E cable. Aperto recommends industrial CAT 5E cable which meets the ANSI/TIA/EIA 568B.2 Category 5e Standard. In the case that the users don't buy this CAT 5E cable with rubber boot, Aperto recommends the use of the rubber boot that can be used with any CAT 5E cable (Please refer to Appendix for details on installing the rubber boot).

1. Identify the location of PoE (bridge).
2. Move the Indoor Unit to its permanent location.
3. Connect the AC/DC universal adapter with the Power over Ethernet.
4. Connect the CAT 5E cable from the radio into the RJ-45 jack (RED) marked "CPE" on the PoE adapter. The PoE adapter is not weather-proof and should be installed indoors.
5. Connect your PC, using the CAT 5E cable (green) that comes with the package, to the PoE RJ-45 jack (Green), marked PC. Connect the power adapter to the PoE adapter and plug the other end to an outlet. The PoE adapter will be powered on and the power indicator on the top panel will turn ON. Also, connect the grounding lug on the PoE to a proper ground.

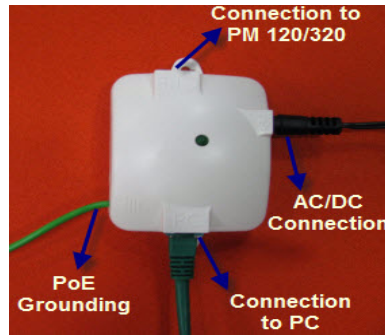


Figure 2-12 *Power Over Ethernet Connections*

Table 2-3 *Ethernet Cable Pinouts*

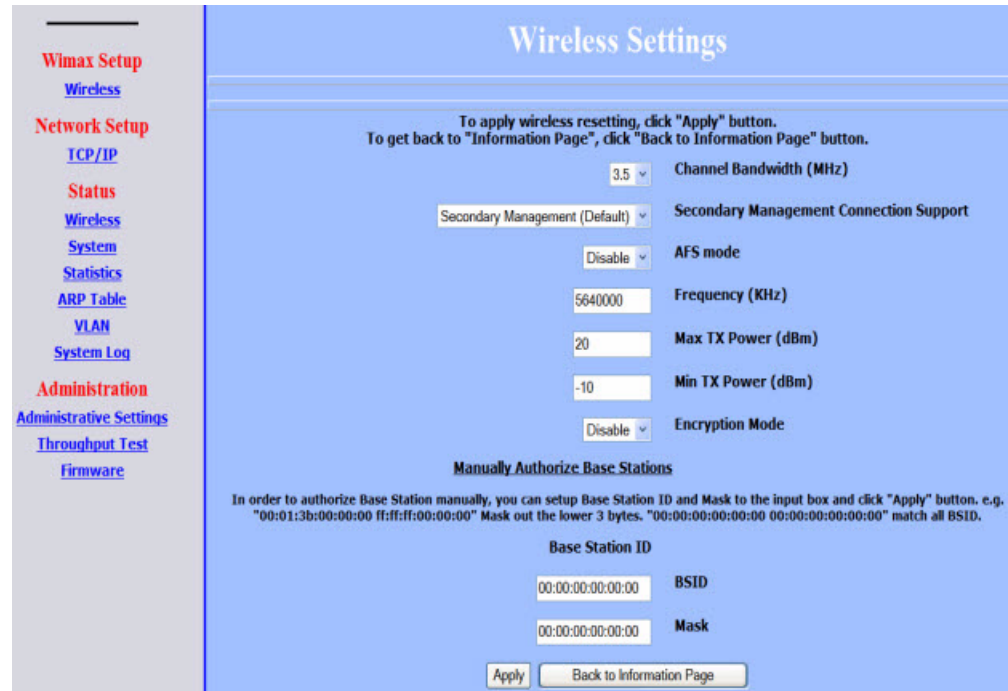
Straight Cable (to Hub)		Crossover Cable (to PC)	
Pin 1: Tx+	Pin 1: Rc+	Pin 1: Rc+	Pin 3: Tx+
Pin 2: Tx-	Pin 2: Rc-	Pin 2: Rc-	Pin 6: Tx-
Pin 3: Rc+	Pin 3: Tx+	Pin 3: Tx+	Pin 1: Rc+
Pin 6: Rc-	Pin 6: Tx-	Pin 6: Tx-	Pin 2: Rc-

2.2.6 Configure the PM 120/320 Using the HTTP Configurator



NOTE: For more details on the PM 120/320 HTTP Configurator, refer to PacketMAX 120/320 Configurator.

1. To configure the PacketMAX 120/320 Series radio, connect the Ethernet cable to the PoE RJ-45 jack (green) and to a computer.
2. Open your Web browser and enter the default IP Address *http://192.168.0.1*. In the Login window, enter the user name as **isp** and password as **isp**.
3. In the left pane of the Configurator, under WiMAX Setup, click Wireless. The Wireless Settings page appears, as shown below. Enter the appropriate parameters. Make sure, Secondary Management (Default) is selected.



Wireless Settings

To apply wireless resetting, click "Apply" button.
To get back to "Information Page", click "Back to Information Page" button.

Channel Bandwidth (MHz): 3.5

Secondary Management (Default): Secondary Management Connection Support

AFS mode: Disable

Frequency (KHz): 5640000

Max TX Power (dBm): 20

Min TX Power (dBm): -10

Encryption Mode: Disable

Manually Authorize Base Stations

In order to authorize Base Station manually, you can setup Base Station ID and Mask to the input box and click "Apply" button. e.g. "00:01:3b:00:00:00 ff:ff:ff:00:00:00" Mask out the lower 3 bytes. "00:00:00:00:00:00 00:00:00:00:00:00" match all BSID.

Base Station ID: 00:00:00:00:00:00

BSID: 00:00:00:00:00:00

Mask: 00:00:00:00:00:00

Buttons: Apply, Back to Information Page

Figure 2-13 Wireless Settings Page

In the Wireless Settings page, the minimum required parameters are Channel Bandwidth and Frequency. Enter the supported Channel Bandwidth, Frequency (as shown in the following table) and BS ID. If the BS ID is not entered, the CPE will register to the first BS it detects. For more details on the parameters of Wireless Settings, see Specifying Wireless Settings.

	PM 120/320-5G	PM 120/320-3G
Frequency	5150000-5925000	3300000-3800000
Channel Bandwidth	3.5, 5, and 7	3.5 and 7

- Click the Apply button. A page appears with a confirmation of configuration changes. Click the Reboot button in the confirmation page for the changes to take effect.



CAUTION: Rebooting disconnects the PM 120/320 and any connections currently running. It may take 60 seconds before the PM 120/320 is running and accessible again. The Status LED flashes while the unit reboots and goes ON when the unit completes the reboot process.

2.2.7 Align the PM 120/320 ODU

1. To align the radio, adjust its position until you receive the acceptable Signal levels as indicated in the table below.

LED	Description
Radio	ON = connection with a base station has been established. OFF = connection with a base station has not been established.
LAN	ON = connection to the Ethernet port has been established. Flash = connection is in use. OFF = connection to the Ethernet port has not been established.
Status	ON = PM 120/320 is fully operational. Blink = PM 120/320 is booting or shutting down.
Signal	Indicates the received signal strength from a base station. 1 LED blinking = there is no link between the PM 120/320 and the base station. 1 LED ON = $RSSI \leq -96\text{dBm}$ 2 LEDs ON = $-95\text{dBm} \leq RSSI < -86\text{dBm}$ 3 LEDs ON = $-85\text{dBm} \leq RSSI < -76\text{dBm}$ 4 LEDs ON = $-75\text{dBm} \leq RSSI < -61\text{dBm}$ 5 LEDs ON = $RSSI \geq -60\text{dBm}$
Power	ON = PM 120/320 is receiving power. OFF = PM 120/320 is not receiving power.

2. Check the CINR and RSSI data in the Configurator by clicking the Wireless link under Status, as shown below. For more details on Configurator, see the Chapter 3.

Wireless Information Page		
Wimax Setup Wireless Network Setup TCP/IP Status Wireless System Statistics ARP Table VLAN System Log Administration VLAN System Log Administration Administrative Settings Throughput Test Firmware	Channel Bandwidth Status (MHz)	3.5
	Frequency (KHz)	3500000 KHz
	RF Profile	TDD mode
	CP Size	1/16
	DBPC Support (Downlink Burst Profile Change)	Enable
	Modulation	Automatic Mode
	Link Manager State	OPERATIONAL
	Link State	link up
	RSSI (Received Signal Strength Indicator)	-55.75 dBm
	CINR (Carrier to Interference and Noise Ratio)	+29.25 dB
	Current TX Power	-4.75 dBm
	RF Mode	licensed
	Initial Ranging Burst Inverting	Software Automatic
	Initial Delay Correction Value	0
	TX Power Range Max	20
	TX Power Range Min	-10
	AFS mode	Disable
	MRTR for SMC in bps	100000
	Lost DL/UL MAP Interval ([600 , 1800] milliseconds)	700
	RNG-RSP Byte Order	Least Robust DIUC as MSB and DCD CCC as LSB

Figure 2-14 *Wireless Information Page*

2.2.8 Rebooting the Subscriber Station and Connecting to the PacketMAX Network

The EMS is the connection to the PacketMax network. When the Subscriber Unit reboots at the end of the installation/antenna alignment process described above, it performs an initialization procedure that brings it up as part of the PacketMax network. During this procedure:

- ❖ The Subscriber Unit requests an IP address from the system's DHCP server. (The DHCP request is passed along by the BS's DHCP relay agent.)
- ❖ The DHCP server responds with the IP address and other information, including the name of the Subscriber Unit's configuration file. The Base Station Unit and the Subscriber Unit both learn the new IP address.
- ❖ The Subscriber Unit downloads its configuration file (as previously created using the WaveCenter Configuration Manager) from the TFTP server.
- ❖ The Subscriber Unit configures itself according to the received configuration file and activates for subscriber traffic.



3

Configuring PacketMAX 120/320 Using Configurator

This chapter provides instructions for using the PacketMAX 120/320 Configurator. The Configurator can be used to perform any of the following functions:

- ❖ Initially configure the PacketMax 120/320 and optimize antenna alignment.
- ❖ View wireless, network, and device information.
- ❖ Pre-provision (pre-configure) a PacketMax 120/320 for later installation.
- ❖ Perform Throughput test
- ❖ Firmware upgrades

This chapter covers the following topics:

- ◆ [PacketMAX 120/320 Configurator](#)
- ◆ [Specifying Wireless Settings](#)
- ◆ [Specifying Network Setup Settings](#)
- ◆ [Viewing Status Information](#)
- ◆ [Configuring Administrative Settings](#)
- ◆ [Throughput Test](#)
- ◆ [Upgrading Firmware](#)



NOTE: *The instructions and screenshots in this chapter showing PacketMax 120 applies to PacketMax 320 as well.*



NOTE: *The PM120/320 configuration can also be done using the Wave-center EMS. For this, the secondary management option should be enabled in the HTTP Configurator.*

3.1 PacketMAX 120/320 Configurator

The PacketMAX 120/320 Configurator is a HTTP Interface which helps you to perform initial configurations for PM 120 and 320 Subscriber Stations.

The PC connects to the Indoor Unit through the Ethernet port. Radio signal and control cables must connect the Indoor Unit to the Outdoor Unit.

Also, when you access the Configurator, ensure the following:

- ❖ The PC/laptop has static IP address
- ❖ There is no firewall

3.1.1 Logging in to the Configurator

To log in to the PM 120/320 Configurator

1. Use an Ethernet cable to connect the Ethernet port (Green) on the PoE to a network-interface card (NIC) in a PC or network hub.

NOTE: The PM 120/320 Ethernet port is equipped with an auto-sensing Ethernet port that allows both regular and crossover cables to be used.

2. Start your Web browser and point it to one of the following default IP address: <http://192.168.0.1>. The Login page appears, with your cursor in the User name field.

NOTE: The default IP address is the same for all PM 120/320 units. Therefore, do not simultaneously connect multiple unconfigured PM 120/320 units to a common Local Area Network (LAN) and try to access them using the default IP address.

NOTE: To connect to the Configurator, your PC's IP address must be on the same subnet (192.168.0.xxx, where xxx is a number from 1 to 253) as the PM 120/320, and the PC's netmask must be set to 255.255.255.0.

3. Enter the default username **isp** and default case-sensitive password **isp** in the appropriate fields.
4. Click the **OK** button to log in. The Information Page appears, as shown below. This read-only page displays network, wireless, and device information about your installation.

Information Page	
Wimax Setup Wireless Network Setup TCP/IP Status Wireless System Statistics ARP Table VLAN System Log Administration Administrative Settings Throughput Test Firmware	Network Mode bridge MAC Address 00:01:3B:DB:00:5E IP Mode dhcp IP Address 172.16.117.31 Subnet Mask 255.255.255.0 Gateway 172.16.117.251
	Wireless Link Status OPERATIONAL Frequency (Tx/Rx) 3.5 GHz Bandwidth 3.5 MHz RF Profile TDD mode CP Size 1/16 Tx Power (Max/Min/Cur) 20 / -10 / -4.75 dBm Signal (RSSI/CINR) -55.75 dBm / +29.25 dB Base Station 01:01:3B:C0:07:5C
	Device Board Serial Number DE200311 Device Name Test Location Firmware Revision V3.1.2 R1108 Build Date 2008/08/29 20:15

Figure 3-1 Information Page

3.1.2 Understanding the Pages in the Configurator

The PM 120/320 Configurator is a Web-based utility that provides an intuitive user interface for viewing and changing configuration and status settings.

The page header at the top of the page shows the name of the page. The navigation panel on the left side provides links you can click to display the pages in the Configurator. The links are organized into the following categories:

- ❖ **WiMAX Setup:** lets you access the pages for viewing and configuring the PM 120/320 wireless and security settings.
- ❖ **Network Setup:** lets you access the pages for viewing and configuring the PM 120/320 TCP/IP settings.
- ❖ **Status:** lets you view the wireless, System, Statistics, ARP Table, and System Log details.
- ❖ **Administration:** lets you view and configure administrative settings and upgrade the PM 120/320 firmware.

After you change configuration settings on a page, click Apply before going to another page; otherwise, your changes will be discarded. Clicking Apply saves in memory all changes made on the currently displayed page. When you click this button, another page appears with a Reboot button. You can either click the Reboot button to reboot

the PM 120/320 and have the new configuration settings take effect, or change settings on other pages and reboot after all of your configuration changes are complete.

CAUTION: Rebooting disconnects the PM 120/320 and any connections currently running. It may take up to 60 seconds before the PM 120/320 is running and accessible again. When you reboot the PM 120/320, the Status LED flashes while the unit reboots and goes ON when the unit completes the reboot process. Another way to reboot the unit is by using the Reboot button on the Administration Settings page.

The main panel is the viewing area on the page. When you select a link in the navigation panel, the fields of the page are displayed in the main panel. This is where you view and change the PM 120/320 configuration settings.

The remaining sections describe the Configurator pages you can use to view and change the PM 120/320 configuration and status.

3.2 Specifying Wireless Settings

After logging in to the Configurator, use the following procedure to set the PM 120/320 wireless settings.

NOTE: The default configuration settings for most parameters should work well for the majority of installations. Only those settings that should be confirmed or adjusted as part of the quick-start instructions are described in this section.

To specify the wireless settings

1. In the left pane, under WiMAX Setup, click Wireless. The Wireless Settings page appears.

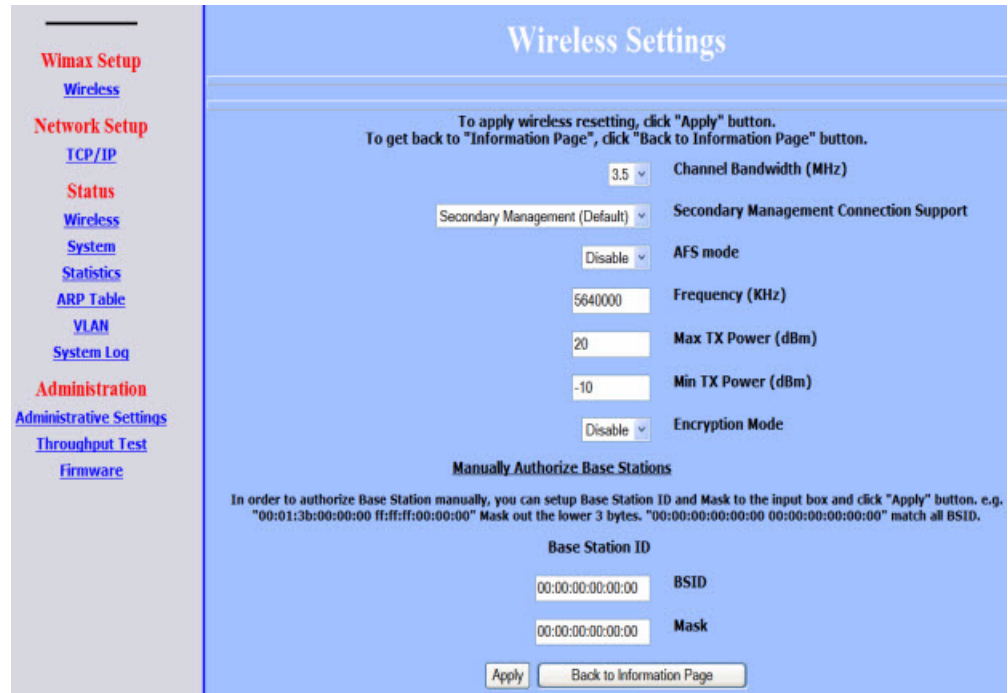


Figure 3-2 Wireless Settings Page

2. Set the parameters in this page. You can keep all the default values, except **Channel Bandwidth (MHz)**, **Frequency (KHz)**, **AFS mode**, and **Encryption Mode** fields.
3. Click the **Apply** button. A page tells you that your configuration changes have been saved, but will not be applied until you reboot the PM 120/320.
4. Click the **Reboot** button to save the settings.

Table 3-A Wireless Settings Parameters

Parameter	Description
Channel Bandwidth (MHz)	Select a channel Bandwidth that best suits your application's bandwidth needs and is allowed by your license. The base station must be set to the same bandwidth. PM-BSR-120-5G Supports 3.5 MHz, 5 MHz, and 7 MHz. PM-BSR-120-3G Supports 3.5 MHz and 7 MHz.
Secondary Management Connection Support	Confirm that the default setting (Secondary Management Support) is selected. If not, select it. In this mode, configuration settings are configured from the WaveCenter EMS Pro. See WaveCenter EMS Pro User Manual for more details.
AFS mode	Lets you enable or disable Automatic Frequency Scanning. By default, AFS mode is disabled. For more information on AFS, see Automatic Frequency Scanning (AFS).

Frequency (kHz)	Sets the frequency, in kHz. For PM 120/320-5G, frequency range is 5150000 - 5925000 For PM 120/320-3G, frequency range is 3300000 - 3800000
Max TX Power (dBm)	This value should match the PM 120/320 antenna. Examples: The Max Tx Power value cannot exceed 30dB. Note: When setting the Max Tx Power value, do not exceed the max EIRP allowed by your license. When adding the values for Tx Antenna Gain and Max Tx Power, the sum of these values must equal or be less than the max EIRP that your license allows. The gain of the internal antenna is 17dB, requiring the Max Tx Power to be set to (max EIRP – 17).
Min Tx Power (dBm)	Confirm that the default setting (-10) is selected. If not, select it.
Encryption Mode	Disable or enable Encryption for SS.
BSID and Mask	Use the standard format for MAC addresses (six 2-digit hexadecimal numbers separated by colons) to enter the base station ID. Example: "12:34:56:78:9a:bc". You can enter up to 8 base station addresses, separating each by pressing the Enter key. To match all BSIDs, mask out the lower 3 bytes. "00:00:00:00:00:00 00:00:00:00:00:00" .

3.2.1 Automatic Frequency Scanning (AFS)

PM 120/320 can be configured through the HTTP Configurator to scan up to ten frequencies to look for an authorized WiMax Base Station. When the AFS mode is enabled in the HTTP Configurator, PM 120/320 scans frequency list provided in the AFS Scanning Frequency field and measures the signal level (SNR) of each approved Base Station. After scanning, PM 120/320 synchronizes the scanned Base Stations with the highest signal level.

3.2.1.1 How Does AFS Work?

- ❖ If any channels are marked as DFS Preferred Channels in the WaveCenter EMS, PM 120/320 will give higher priority to these channels while scanning.
- ❖ If DFS is disabled through WaveCenter EMS Pro, PM 120/320 will scan only the channels provided in the AFS list.

To enable the Automatic Frequency Scanning

1. Select Enable in the AFS mode field of the Wireless Settings page. When you enable AFS, the Wireless Settings page looks as follows:

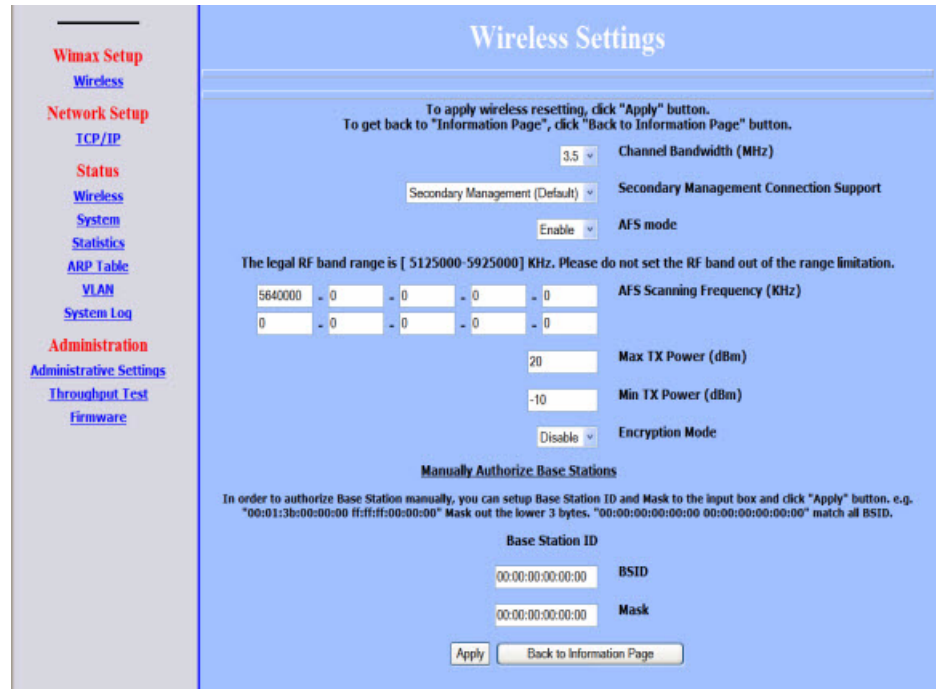


Figure 3-3 Wireless Settings - AFS Enabled

2. Set the AFS Scanning Frequency (kHz) parameters in this page. See the following table for more details on the AFS Parameters.

Table 3-B AFS Parameters

Parameter	Description
AFS Mode	Lets you enable or disable Automatic Frequency Scanning. By default, AFS mode is disabled.
AFS Scanning Frequency (kHz)	This is a list of up to ten frequencies to be scanned in the order listed. Frequencies are in kHz and must be within the legal RF band for the PM120/320.

3.3 Specifying Network Setup Settings

After specifying wireless settings, use the following procedure to specify the network setup settings.

1. In the left pane, under Network Setup, click TCP/IP. The TCP/IP Settings page appears.

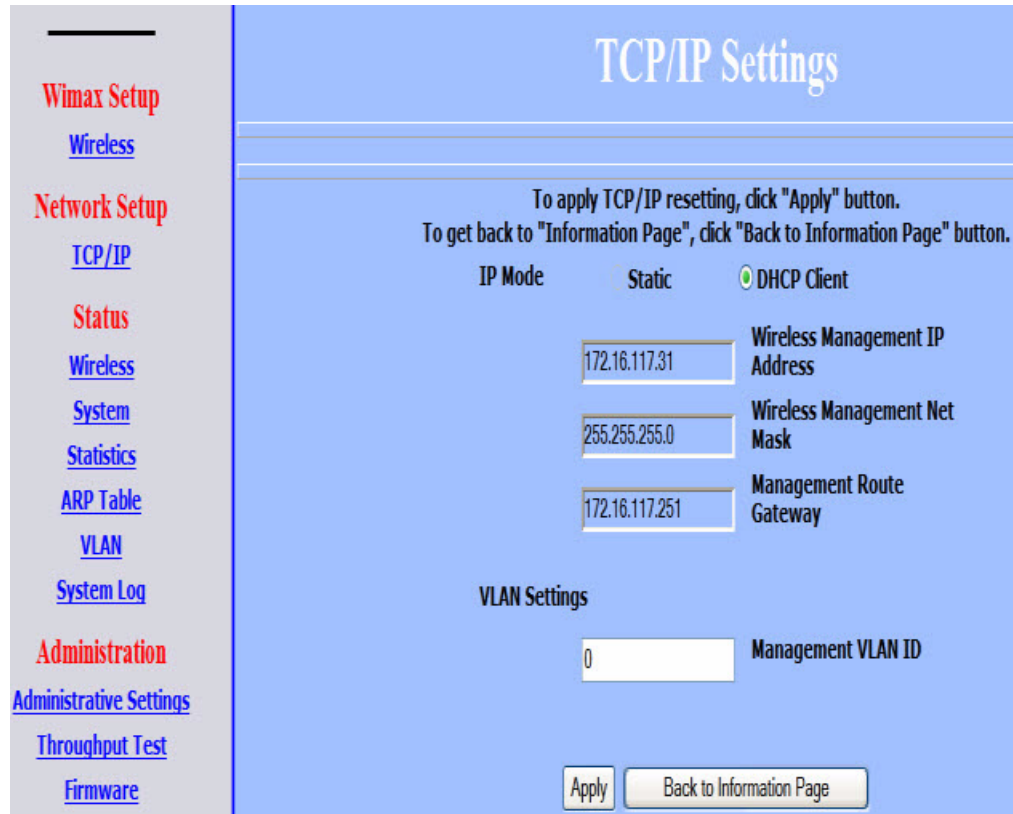


Figure 3-4 TCP/IP Settings Page

2. If the PM 120/320 is set to unmanaged mode (No Secondary Management), set the parameters. Otherwise, skip to step 3 below.

NOTE: By default, the PM 120/320 is set to use secondary managed mode. In this mode, the settings are set automatically and the fields are unavailable. If you switch to unmanaged mode (No Secondary Management), you can specify the settings in manually. To change between the two modes, use Secondary Management Connection Support on the Wireless Settings page.

3. Click the Apply button. When the next page appears, click the Reboot button to reboot the PM 120/320 and put your saved settings into effect.



CAUTION: Rebooting disconnects the PM 120/320 and any connections currently running. It may take 60 seconds before the PM 120/320 is running and accessible again. The Status LED flashes while the unit reboots and goes ON when the unit completes the reboot process.

3.4 Viewing Status Information

The Configurator provides a Status section that lets you display status pages for monitoring the PM 120/320. This section describes how to use these pages to monitor the PM 120/320.

3.4.1 Information Page

The Information Page is the first page that appears when you log in to the Configurator. You can also display this page from another page in the Configurator by clicking the Back to Information Page button at the bottom of the pages in the WiMAX Setup, Network Setup, and Administration sections.

The Information Page is a read-only page that displays network, wireless, and device information.

Information Page	
Wimax Setup Wireless Network Setup TCP/IP Status Wireless System Statistics ARP Table VLAN System Log Administration Administrative Settings Throughput Test Firmware	Network Mode bridge MAC Address 00:01:3B:DB:00:5E IP Mode dhcp IP Address 172.16.117.31 Subnet Mask 255.255.255.0 Gateway 172.16.117.251
	Wireless Link Status OPERATIONAL Frequency (Tx/Rx) 3.5 GHz Bandwidth 3.5 MHz RF Profile TDD mode CP Size 1/16 Tx Power (Max/Min/Cur) 20 / -10 / -4.75 dBm Signal (RSSI/CINR) -55.75 dBm / +29.25 Base Station 01:01:3B:C0:07:5C
	Device Board Serial Number DE200311 Device Name Test Location Firmware Revision V3.1.2 R1108 Build Date 2008/08/29 20:15

Figure 3-5 Information Page

Information Page Parameter	Description
Network	
Mode	PM 120/320's operating mode (for example, bridge, router, etc.).
MAC Address	PM 120/320 Media Access Control (MAC) address, as defined on the TCP/IP Settings page.
IP Mode	IP mode of the PM 120/320, as defined on the TCP/IP Settings.
IP Address	IP address of the PM 120/320.

Subnet Mask	Subnet mask of the PM 120/320.
Gateway	Gateway mask of the PM 120/320.
Wireless	
Link Status	Shows whether the PM 120/320 is connected to the base station.
Frequency (Tx/Rx)	PM 120/320 transmit and receive frequencies, as defined on the Wireless Settings page.
Bandwidth	Bandwidth used by the PM 120/320.
RF Profile	PM 120/320 duplex method, as defined on the Wireless Settings page.
CP Size	PM 120/320 cyclic prefix size, as define on the Wireless Settings page.
Tx Power (Max/Min/Cur)	PM 120/320 maximum, minimum, and current transmit power levels, in dBm. The maximum and minimum settings are defined on the Wireless Settings page.
Signal (RSSI/CINR)	RSSI, CINR, SNR, and average signal strength, in dBm. - RSSI - the higher the value, the higher the transmit rate (up to the maximum). Conversely, the lower the RSSI, the lower the transmission speed until 0 is reached (no connectivity). - CINR - the higher the value, the more throughput a link can maintain.
Base Station	MAC address with which the PM 120/320 is communicating, as defined on the Wireless Settings page.
Device	
Board Serial Number	Serial number of the PM 120/320 printed circuit board.
Device Name	Name of the PM 120/320 unit, as defined on the Administrative Settings page (see section 3.4.1). Default is PM 120/320.
Location	Location of the PM 120/320, as defined on the Administrative Settings page
Firmware Revision	Revision number of the firmware used by the PM 120/320.
Build Date	Build date of the firmware used by the PM 120/320.

3.4.2 Wireless Information Page

The Wireless Information page shows information about the PM 120/320 's wireless operation. The user-configurable information on this page can be set using the Wireless Settings page.

Wireless Information Page		
Wimax Setup Wireless Network Setup TCP/IP Status Wireless System Statistics ARP Table VLAN System Log Administration VLAN System Log Administration Administrative Settings Throughput Test Firmware	Channel Bandwidth Status (MHz)	3.5
	Frequency (KHz)	3500000 KHz
	RF Profile	TDD mode
	CP Size	1/16
	DBPC Support (Downlink Burst Profile Change)	Enable
	Modulation	Automatic Mode
	Link Manager State	OPERATIONAL
	Link State	link up
	RSSI (Received Signal Strength Indicator)	-55.75 dBm
	CINR (Carrier to Interference and Noise Ratio)	+29.25 dB
	Current TX Power	-4.75 dBm
	RF Mode	licensed
	Initial Ranging Burst Inverting	Software Automatic
	Initial Delay Correction Value	0
	TX Power Range Max	20
	TX Power Range Min	-10
	AFS mode	Disable
	MRTR for SMC in bps	100000
	Lost DL/UL MAP Interval ([600 , 1800] milliseconds)	700
	RNG-RSP Byte Order	Least Robust DIUC as MSB and DCD CCC as LSB

Figure 3-6 **Wireless Information Page**

Wireless Information Page Parameter	Description
Channel Bandwidth Status (MHz)	Bandwidth, in MHz, of the PM 120/320, as defined on the Wireless Settings page.
Frequency (KHz)	Frequency, in kHz, of the PM 120/320, as defined on the Wireless Settings page.
RF Profile	RF profile of the PM 120/320, as defined on the Wireless Settings page.
CP Size	Cycle prefix size, as defined on the Wireless Settings page.
DBPC Support (Downlink Burst Profile Change)	Shows whether Downlink Burst Profile Change is enabled or disabled.
Modulation	Modulation used by the PM 120/320.
Link Manager State	Shows where in the network connection process the CPE is. For example if the CPE is scanning for a BS downlink message, receiving a DHCP address assignment, or if the CPE to BS link is operational.
Link State	Shows whether the PM 120/320 link is up or down.
RSSI (Received Signal Strength Indicator)	Strength of the Received Signal Strength Indicator, in dBm, received by your PM 120/320 . The higher the value, the higher the transmit rate (up to the maximum). Conversely, the lower the RSSI, the lower the transmission speed until 0 is reached (no connectivity).
CINR (Carrier to Interference and Noise Ratio)	Carrier to Interference and Noise Ratio, in dB, for your PM 120/320. The higher the value, the more throughput a link can maintain.

Current TX Power	Current transmit power, in dBm, for your PM 120/320 .
RF Mode	Current radio-frequency mode (licensed or unlicensed) for your PM 120/320 .
Initial Ranging Burst Inverting	This feature is provided for Engineering development use, and is an undocumented feature.
Initial Delay Correction Value	This feature is provided for Engineering development use, and is an undocumented feature.
TX Power Range Max	The maximum transmit power range of the PM 120/320 , as defined on the Wireless Settings page.
TX Power Range Min	The minimum transmit power range of the PM 120/320 , as defined on the Wireless Settings page.
MRTR for SMC in bps	The minimum reserved traffic rate for the secondary management channel.
Lost DL/UL MAP Interval ([600 , 1800] milliseconds)	The time in seconds that the CPE will maintain the link to the BS using the last DL or UL MAP received.
AFS Mode	This feature is provided for Engineering development use, and is an undocumented feature.
RNG-RSP Byte Order	This feature is provided for Engineering development use, and is an undocumented feature.

3.4.3 System Information Page

The System Information page shows information about the PM 120/320's wireless configuration settings and operation.

System Information Page		
Wimax Setup Wireless Network Setup TCP/IP Status Wireless System Statistics ARP Table VLAN System Log Administration Administrative Settings Throughput Test Firmware	Bridge br0 IP Address	172.16.117.31
	Bridge br0 Net Mask	255.255.255.0
	Encryption Support	NO
	PKM Mode	NO PKM
	Secondary Management Connection Support	Secondary Management (Default)
	IP Managed Mode	IP-managed mode (Default)
	Bridge/Router Mode	bridge
	IP Mode	dhcp
	MAC Msg Strick Checking	Disable
	Pack Enable For Primary CID	Enable
	Fragment Enable For Primary CID	Enable
	TX Overrun Fix	Disable
	Bypass QoS Amitted Bit (absent)	Disable
	Bypass Strick QoS Tx Policy Checking	Disable
	Enable 0 Symbol HFDD Patch	Disable
	Base Station ID	01:01:3B:C0:07:5C

Figure 3-7 System Information Page

System Information Page Parameter	Description
Bridge br0 IP Address	Wired IP address of the PM 120/320 , as defined on the TCP/IP Settings page.
Bridge br0 Net Mask	Wired netmask of the PM 120/320 , as defined on the TCP/IP Settings page.
Encryption Support	Shows whether encryption is enabled or disabled on the PM 120/320 , as defined on the Security Settings page.
PKM Mode	Shows whether private key management is enabled or disabled on the PM 120/320 , as defined on the Security Settings page.
Secondary Management Connection Support	Shows whether the secondary management support has been enabled.
IP Managed Mode	Shows whether an IP address has been assigned to the CPE using DHCP operating over the IEEE 802.16 secondary management channel.
Bridge/Router Mode	Shows whether the PM 120/320 is configured for bridge or router mode, as defined on the TCP/IP Settings page.
IP Mode	Shows whether IP mode is set to static or DHCP setting, as defined on the TCP/IP Settings page.
MAC Msg Strict Checking	Shows whether MAC Message Strict Checking is enabled or disabled, as defined on the Wireless Settings page.
Pack Enable For Primary CID	Shows whether Pack Enable for Primary CID is enabled or disabled, as defined on the Wireless Settings page.
Fragment Enable For Primary CID	Shows whether Fragment Enable For Primary CID is enabled or disabled, as defined on the Wireless Settings page.
TX Overrun Fix	Shows whether TX Overrun Fix is enabled or disabled, as defined on the Wireless Settings page.
Bypass QoS Admitted Bit (Absent)	Shows whether Bypass QoS Admitted Bit (Absent) is enabled or disabled.
Bypass Strict QoS Tx Policy Checking	Shows whether Bypass Strict QoS Tx Policy Checking is enabled or disabled.
Enable 0 Symbol HFDD Patch	Shows whether Enable 0 Symbol HFDD Patch is enabled or disabled, as defined on the Wireless Settings page.
Base Station ID List	Shows the base station ID list, as defined on the Wireless Settings page.

3.4.4 Statistics Information Page

The Statistics Information page shows statistics of the wired and wireless packets sent and received by the PM 120/320.

Statistics Information Page								
Wimax Setup Wireless Network Setup TCP/IP Status Wireless System Statistics ARP Table VLAN System Log Administration Administrative Settings Throughput Test Firmware	Statistics Status							
	Wired							
	Rx							
	bytes	packets	errs	drop	fifo	frame	compressed	multicast
	62675	571	0	0	0	0	0	0
	Tx							
	bytes	packets	errs	drop	fifo	colls	carrier	compressed
	283409	641	0	0	0	0	0	0
	Wireless							
	Rx							
	bytes	packets	errs	drop	fifo	frame	compressed	multicast
	0	0	0	756	0	0	0	0
	Tx							
	bytes	packets	errs	drop	fifo	colls	carrier	compressed
	252469	1043	55	0	0	0	0	0

Figure 3-8 **Statistics Information Page**

Statistics Information Page Parameter	Description
Wired	Received (Rx) and transmitted (Tx) statistics for the PM 120/320 's wired interface. - Bytes: number of bytes transmitted (Tx) or received (Rx) by the PM 120/320 on the wired network. - Packets: number of packets transmitted (Tx) or received (Rx) the PM 120/320 on the wired network. - Errs: number of transmit/receive errors detected by the PM 120/320 on the wired network. - Drop: number of dropped transmitted (Tx) or received (Rx) packets detected by the PM 120/320 on the wired network. - Fifo: number of transmitted (Tx) or received (Rx) packets first in/first out between the PM 120/320 and the wired network. - Frame: number of frames transmitted (Tx) or received (Rx) by the PM 120/320 on the wired network. - Compressed: number of compressed frames transmitted (Tx) or received (Rx) by the PM 120/320 on the wired network - Multicast: number of multicast frames transmitted (Tx) or received (Rx) by the PM 120/320 on the wired network
Wireless	Received (Rx) and transmitted (Tx) statistics for the PM 120/320 's wireless interface. - Bytes: number of bytes transmitted (Tx) or received (Rx) by the PM 120/320 on the wireless network. - Packets: number of packets transmitted (Tx) or received (Rx) the PM 120/320 on the wireless network. - Errs: number of transmit/receive errors detected by the PM 120/320 on the wireless network. - Drop: number of dropped transmitted (Tx) or received (Rx) packets detected by the PM 120/320 on the wireless network. - Fifo: number of transmitted (Tx) or received (Rx) packets first in/first out between the PM 120/320 and the wireless network. - Frame: number of frames transmitted (Tx) or received (Rx) by the PM 120/320 on the wireless network. - Compressed: number of compressed frames transmitted (Tx) or received (Rx) by the PM 120/320 on the wireless network. - Multicast: number of multicast frames transmitted (Tx) or received (Rx) by the PM 120/320 on the wireless network

3.4.5 ARP Information Page

The PM 120/320 has an Address Resolution Protocol (ARP) table that automatically maps the PM 120/320 IP address to the MAC address of a switch. The ARP Information page shows the PM 120/320 IP address and the corresponding MAC address of the switch.

Wimax Setup Wireless Network Setup TCP/IP Status Wireless System Statistics ARP Table VLAN System Log Administration Administrative Settings Throughput Test Firmware	ARP Information Page ARP Status ARP Table 192.168.0.10000:1C:23:8A:33:64 172.16.117.25100:19:D1:0A:29:3D
---	--

Figure 3-9 ARP Information Page

3.4.6 System Log

The PM 120/320 has separate logs that contain information about the unit's wireless and router operations. Using the System Information page, you can view the information in these logs.

- ❖ The Wireless Log area shows wireless information recorded in the wireless log.
- ❖ The Router Log area shows router information recorded in the router log.

Both areas have a **Refresh** button that can be used to update the information displayed in the respective areas on this page.

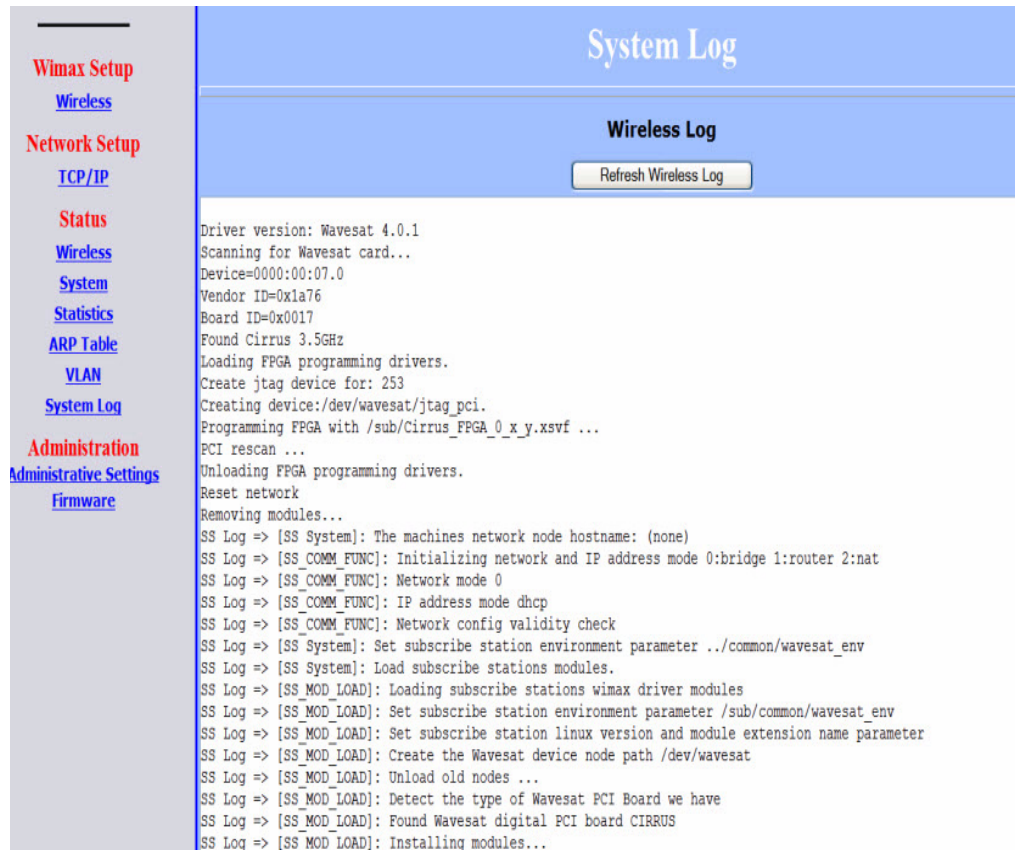


Figure 3-10 System Log Page

3.5 Configuring Administrative Settings

All administrative tasks are performed from the Administrative Settings page. To display the Administrative Settings page, click the Administrative Settings link under Administration in the navigation panel of the Configurator.

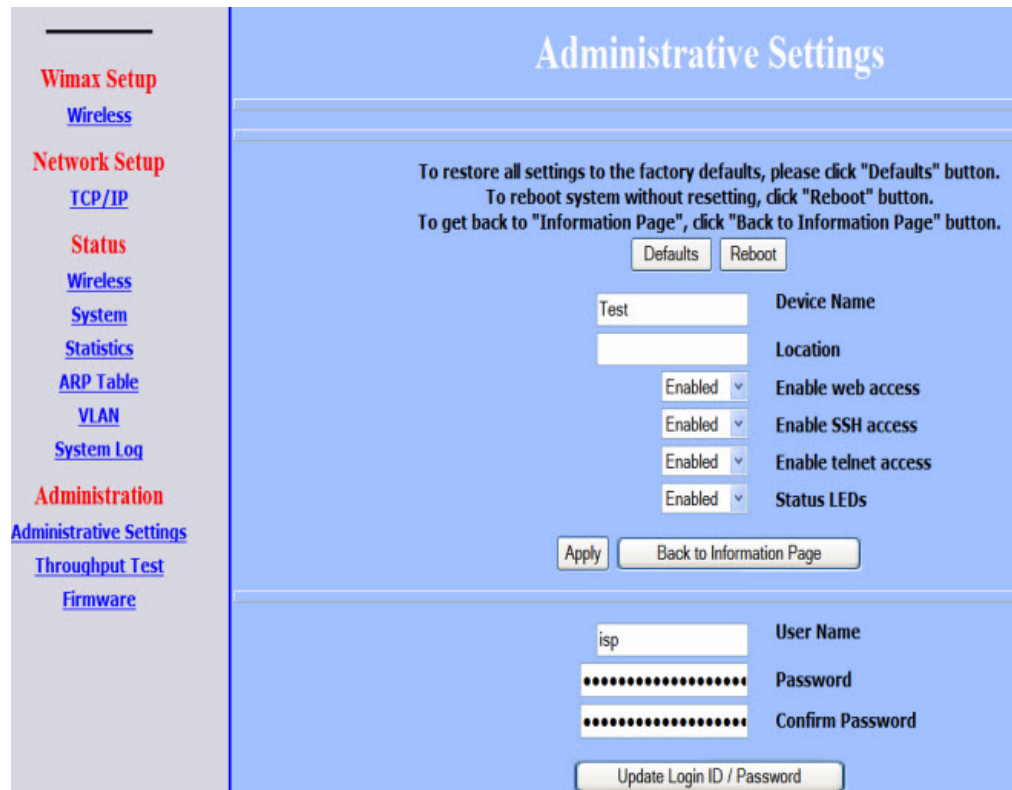


Figure 3-11 Administrative Settings Page

3.5.1 Returning to Factory Default Settings

Using the Defaults button on the Administrative Settings page, you can return the PM 120/320 to the settings that were in effect when you powered it up for the first time. When you click this button, a precautionary message tells you that proceeding will remove any custom settings you set and return all parameters to their factory default settings. You can then click OK to continue or Cancel to cancel the operation.

3.5.2 Rebooting the PM 120/320 Unit

The Reboot button on the Administrative Settings page provides one way to reboot the PM 120/320 (the other way is using the Apply and Reboot button). If you change any PM 120/320 configuration settings, you must use one of these methods to reboot the PM 120/320 and put the settings into effect.

When you click this button, a precautionary message tells you that proceeding will reboot the PM 120/320. You can then click OK to continue or Cancel to cancel the operation.

CAUTION: Rebooting disconnects the PM 120/320 and any connections currently running. It may take up to 60 seconds before the PM 120/320 is running and accessible again. When you reboot the PM 120/320,

the Status LED flashes while the unit reboots and goes ON when the unit completes the reboot process.

3.5.3 Changing the Device Name and Location

The PM 120/320 device name is the name used to identify the device. The device name appears on the Information Page. If your installation has a number of devices, you will probably want to assign a unique device name to each PM 120/320.

To change the device name:

1. On the Administrative Settings page, delete the current name shown in the Device Name field and enter a new name.
2. To change the location, delete the current location shown in the Location field and enter a new location.
3. Click the Apply button to save your changes. When the next page appears, either:
 - Click the Reboot button to reboot the PM 120/320 and apply the settings.
 - Change settings on other pages, then reboot the PM 120/320 to apply all the new settings.

3.5.4 Enabling or Disabling Web, SSH, and Telnet Access

Using the Administrative Settings page, you can enable or disable Web access, SSH access, and Telnet access to the PM 120/320.

- ❖ If you disable Web access, you will not be able to access the PM 120/320 using a browser.
- ❖ If you disable SSH access, you will not be able to access the PM 120/320 via an SSH session.
- ❖ If you disable Telnet access, you will not be able to access the PM 120/320 using a Telnet session.

To enable or disable Web, SSH, and Telnet access to the PM 120/320, use the following procedure:

1. To enable or disable Web access to the PM 120/320, click the down arrow next to Enable Web Access and select Enable or Disable from the drop-down list.
2. To enable or disable SSH access to the PM 120/320, click the down arrow next to Enable SSH Access and select Enable or Disable from the drop-down list.
3. To enable or disable Telnet access to the PM 120/320, click the down arrow next to Enable telnet Access and select Enable or Disable from the drop-down list.
4. Click the Apply button to save your changes. Then either:
 - Click the Reboot button on the next page that appears to apply the settings and reboot the PM 120/320 at this time.
 - Change any other configuration settings you want to modify. When finished, apply all the new and reboot the PM 120/320.



3.5.5 Enabling or Disabling the Status LEDs

Using the Administrative Settings page, you can enable or disable the 10 status LEDs on the rear panel of the PM 120/320. By default, the LEDs are configured to be ON. This means they show the status of the PM 120/320. If the PM 120/320 will be installed in a location where the LEDs cannot be observed, you can disable them and rely on the status screens to assess the status of the PM 120/320.

To enable or disable the status LEDs on the PM 120/320, use the following procedure.

1. Click the down arrow next to Status LEDs and select Enable or Disable from the drop-down list.
2. Click the Apply button to save your changes. Then either:
 - Click the Reboot button on the next page that appears to apply the settings and reboot the PM 120/320 at this time.
 - Change any other configuration settings you want to modify. When finished, apply all the new and reboot the PM 120/320.

3.5.6 Changing Log In Settings

Using the Administrative Settings page, you can change the user name and password used to log in to the Configurator. For security purposes, we recommend you change the default password.

1. To change the user name, click in the User Name field, delete the name shown, and enter a new user name.
2. To change the log in password, click in the Password field, delete the entry, and enter a new password.
3. Click in the Confirm Password field, delete the entry, and enter the same password you typed in step 2.
4. Click the Apply button to save your changes. When the next page appears, either:
 - Click the Reboot button to reboot the PM 120/320 and apply the settings.
 - Change settings on other pages, then reboot the PM 120/320 to apply all the new settings.

3.6 Throughput Test

This feature allows the user to perform throughput test using the HTTP Configurator. It will also allow the user to view the status and the result of the throughput test.

To perform Throughput Test

1. Log in to the HTTP Configurator.
2. In the left pane, under Administration, click Throughput Test. The Throughput Test page opens as shown below



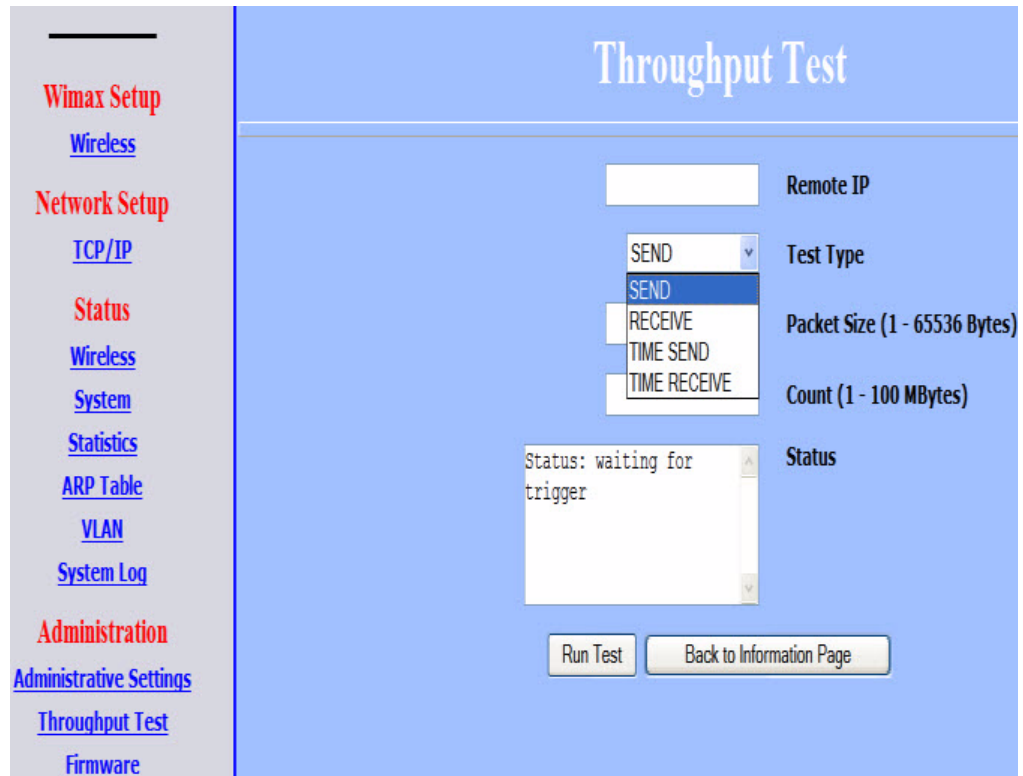


Figure 3-12 Throughput Test

3. Enter the appropriate parameters. See the Throughput Test Parameters table for more information.
4. Click Run Test. The status of the throughput test will be displayed on the Status field.

Table 3-C Throughput Test Parameters

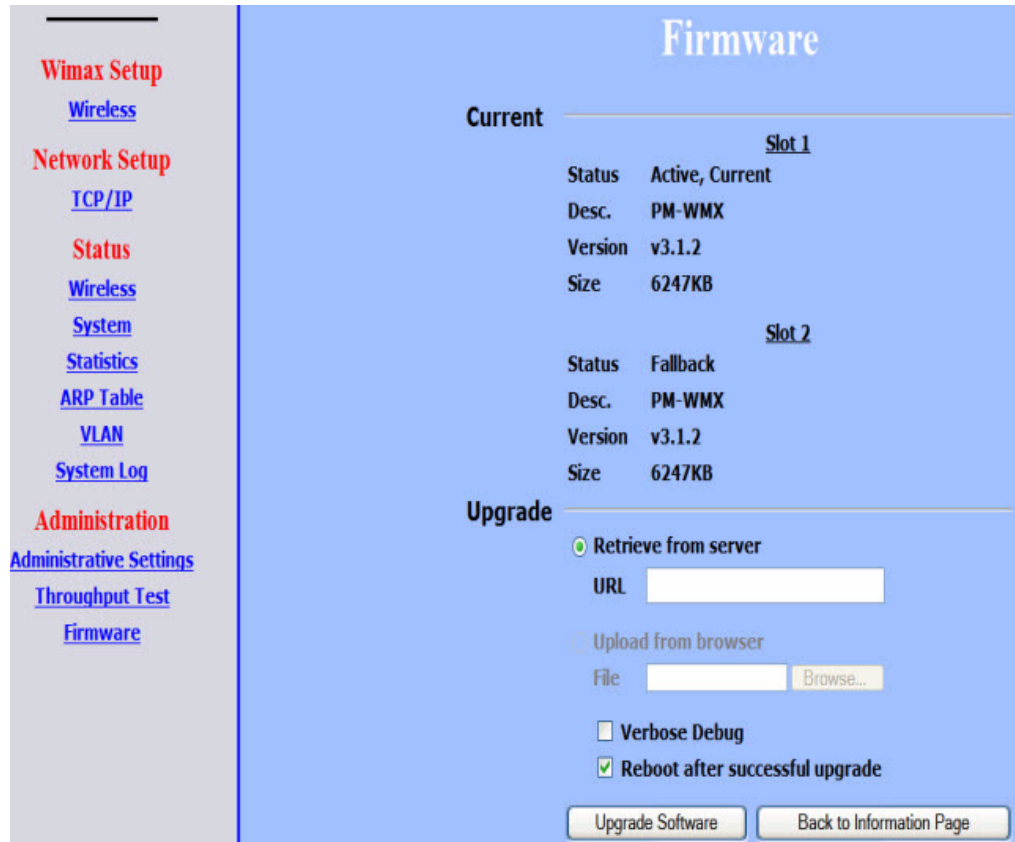
Throughput Test Parameters	Description
Remote IP	IP address of the host to send or receive packets.
Test Type	Select a test type from the drop-down menu. The following options are available: SEND: RECEIVE TIME SEND TIME RECEIVE
Packet Size	Size of packet to be sent or received, default is 64KB.
Count	For SEND and RECEIVE, this field specifies the byte count. The valid values are 1-100. By default, 1MB. For TIME SEND and TIME RECEIVE, this field specifies the duration in seconds.
Status	Shows the result of the Throughput Test, such as Waiting For Trigger, Test In Progress, Success, and Failure.

3.7 Upgrading Firmware

From time to time, Aperto networks makes new firmware available for the PM 120/320. The firmware may add new features to the PM 120/320 and/or fix problems.

To upgrade the firmware

1. Log in to the Configurator.
2. In the left pane, under Administration, click Firmware. The Firmware page appears. The Current section shows information about the current firmware installed. The Upgrade section is where you specify the new firmware you want to install.



Firmware	
Current	
	<u>Slot 1</u>
Status	Active, Current
Desc.	PM-WMX
Version	v3.1.2
Size	6247KB
	<u>Slot 2</u>
Status	Fallback
Desc.	PM-WMX
Version	v3.1.2
Size	6247KB
Upgrade	
☒ Retrieve from server URL	
☐ Upload from browser File Browse...	
☐ Verbose Debug ☒ Reboot after successful upgrade	
Upgrade Software Back to Information Page	

Figure 3-13 Firmware Upgrade Page

3. To view the output of what is happening throughout the firmware upgrade process, check **Verbose Debug**.
4. To reboot the PM 120/320 after its firmware has been upgraded, check **Reboot after successful upgrade**.
5. Under **Upgrade**, select retrieve from server (if it is not already selected).
6. In the **URL** field, enter the Uniform Resource Locator (URL) of the FTP server where the new firmware file is located.
7. Log in to the server and download the firmware file.

8. After the firmware file has been downloaded, upload it to the PM 120/320 using your browser. Under **Upload from browser**, click the **Browse**, select the firmware file, and click **OK**.
9. Click Upgrade Software to start the upgrade procedure. If you checked **Reboot** after successful upgrade, the PM 120/320 reboots automatically following the firmware upgrade; otherwise, you must manually reboot the PM 120/320 to have the new firmware upgrade take effect.



NOTE: *Firmware upgrade can also be done via the WaveCenter EMS using the Bulk Upgrade option as described in the 1.5.1 Upgrades section.*



A

Specifications

A.1 General Specifications

1.1.1 Models

PM120: Bridge mode, VLAN mode, 5 hosts, and 8 Service Flows

PM320: Bridge, VLAN, 250 hosts, and 14 Service Flows

1.1.2 Interfaces

The PacketMax 120/320 CPEs provide data and/or voice connectivity to the user through its internal unit (IDU). The internal interface between IDU and ODU uses Power over Ethernet (PoE) to provide data as well as power to the external ODU.

- ❖ Network interface (IDU): 10/100 Base T (RJ45), PoE
- ❖ External antenna Connector (ODU): N-connector (for extended range models only)

1.1.3 Power requirements

100 to 240 VAC, ~50 to 60 Hz

Consumption: 15 W (maximum)

1.1.4 RF and Antenna Specifications

Characteristics	PacketMax 120-5G	PacketMax 120-3G
RF transmit power	20 dBm	20 dBm
Antenna gain	20 and 24 dBi	17 and 20 dBi
Azimuth and elevation	22 deg	22 deg
Polarization	Vertical/Horizontal	Vertical/Horizontal

1.1.5 PM 120 General Specifications

	PM 120-5 GHz			PM 120-3 GHz		
	5.8 GHz	5.6 GHz	5.2 GHz	3.65 GHz	3.5 GHz	3.3 GHz
Frequency Range	5.725 - 5.925	5.470 - 5.725	5.150 - 5.350	3.650 - 3.675	3.4 - 3.6	3.3 - 3.4
Channel Bandwidth	3.5, 5, & 7	3.5, 5, & 7	3.5, 5, & 7	3.5 & 7	3.5 & 7	3.5 & 7
Access Method	TDD	TDD	TDD	TDD	TDD	TDD
Maximum Output Power						
QPSK	+20 dBm	+20 dBm	+20 dBm	+20 dBm	+20 dBm	+20 dBm
16 QAM	+20 dBm	+20 dBm	+18 dBm	+20 dBm	+20 dBm	+20 dBm
64 QAM	+20 dBm	+17 dBm	+17 dBm	+17 dBm	+20 dBm	+20 dBm
Frequency Step Size	500 kHz	500 kHz	500 kHz	500 kHz	500 kHz	500 kHz
TX Power Attenuation Range (from Max.)	30 dB	30 dB	30 dB	30 dB	30 dB	30 dB
Frequency Stability	+/-8 ppm	+/-8 ppm	+/-8 ppm	+/-8 ppm	+/-8 ppm	+/-8 ppm
Rx/Tx Switching Time	<4 p.S	<4 p.S	<4 p.S	<4 p.S	<4 p.S	<4 p.S
Transmit Power Accuracy	+/-1 dB	+/-1 dB	+/-1 dB	+/-1 dB	+/-1 dB	+/-1 dB

	PM 120-5 GHz			PM 120-3 GHz		
	5.8 GHz	5.6 GHz	5.2 GHz	3.65 GHz	3.5 GHz	3.3 GHz
Rx Input Dynamic Range (3.5 Channel Bandwidth)	52 dB	52 dB	52 dB	52 dB	52 dB	52 dB
Max Rx Input Power, Operational	-18 dBm	-18 dBm	-18 dBm	-18 dBm	-18 dBm	-18 dBm
Max Rx Input Power, No Damage	0 dBm	0 dBm	0 dBm	0 dBm	0 dBm	0 dBm
Fast AGC Range	52 dB	52 dB	52 dB	52 dB	52 dB	52 dB
Total AGC Range	52 dB	52 dB	52 dB	52 dB	52 dB	52 dB

1.1.6 Receiver Threshold Specifications

PM 120-5-GHz			
5.8 GHz, 5.6 GHz, & 5.2 GHz			
Sensitivity (dBm @ BER 10-6)	3.5 MHz	5.0 MHz	7.0 MHz
QPSK-1/2	-93	-91	-90
QPSK-3/4	-91	-89	-88
16QAM-1/2	-88	-86	-85
16QAM-3/4	-85	-83	-81
64QAM-2/3	-80	-78	-77
64QAM-3/4	-78	-76	-75

PM 120-3-GHz		
3.65 GHz, 3.5 GHz, and 3.3 GHz		
Sensitivity (dBm @ BER 10-6)	3.5 MHz	7.0 MHz

QPSK-1/2	-92	-90
QPSK-3/4	-90	-88
16QAM-1/2	-87	-85
16QAM-3/4	-84	-81
64QAM-2/3	-79	-77
64QAM-3/4	-77	-75

1.1.7 Performance and capacities

Characteristics	PacketMax 120 series	PM 320 series
Max number of hosts	5	250
Supported service flows (uni-directional)	8 (managed)	14
Max net throughput* (net per 3.5 MHz channel)	8.2 Mbps	8.2 Mbps
Packets per Second	5,000 pps	5,000 pps

1.1.8 Mechanical Specifications

Models	Dimensions <u>(L x W x H)</u>	Weight (lbs/kg)
PM120-5G-20-01	21-1/4" x 13" x 4"	7.83 lbs/ 3.55 kg
PM120-5G-24-01	27-1/2" x 17" x 4"	11.47 lbs/ 5.20 kg
PM120-5G-N-01	21-1/4" x 13" x 4"	6.66 lbs/ 3.02 kg
PM320-5G-20-01	25" x 13" x 4"	7.83 lbs/ 3.55 kg
PM320-5G-24-01	27-1/2" x 17" x 4"	11.47 lbs/ 5.20 kg

PM320-5G-N-01	21-1/4" x 13" x 4"	6.66 lbs/ 3.02 kg
PM120-3G-20-01	27-1/2" x 17" x 4"	11.47 lbs/ 5.20 kg
PM120-3G-17-01	21-1/4" x 13" x 4"	6.66 lbs/ 3.02 kg
PM120-3G-N-01	21-1/4" x 13" x 4"	6.66 lbs/ 3.02 kg
PM320-3G-20-01	27-1/2" x 17" x 4"	11.47 lbs/ 5.20 kg
PM320-3G-17-01	21-1/4" x 13" x 4"	6.66 lbs/ 3.02 kg
PM320-3G-N-01	21-1/4" x 13" x 4"	6.66 lbs/ 3.02 kg

1.1.9 Environmental Specifications

Operating Temperature Range	PM 120 - 5GHz		PM 120 - 3 GHz		
	5.6 GHz	5.2 GHz	3.65 GHz	3.5 GHz	3.3 GHz
Cold Start Temperature	-40 C	-40 C	-40 C	-40 C	-40 C
Operating Temperature	-40 to +55 C	-40 to +55 C	-40 to +55 C	-40 to +55 C	-40 to +55 C

1.1.10 Mounting and Brackets

The Outdoor Units can handle pole diameters between 1.0 to 3.0 inches.

1.1.11 Regulatory Standards

Safety Standards : IEC 60950-1 (UL 60950-1 & EN 60950)

EMI Standards : EN 301 489, EN 55022 and FCC Part 15 Class B

Radio: EN 301 753, EN 301 021



B

Event Reporting

The PacketMax subscriber equipment can be configured to report events by any of several means:

- ❖ SNMP traps.
- ❖ Logging to a Syslog server.

B.1 PacketMax 120/320

Table B-1 SS Events

CPE Mac Addr:<Mac Addr>	Wait for DSA/DSC Acknowledge Timer Expired
CPE Mac Addr:<Mac Addr>	Interface link up
CPE Mac Addr:<Mac Addr>	Interface link down
CPE Mac Addr:<Mac Addr>	Successful handshake to establish IP connectivity
CPE Mac Addr:<Mac Addr>	Detected unknown TLV during TLV parsing process
CPE Mac Addr:<Mac Addr>	Binary to ascii successful
CPE Mac Addr:<Mac Addr>	PM120 configuration on a PM320 hardware
CPE Mac Addr:<Mac Addr>	A failure of dynamic service happened during the dynamic services process



C

Cables, Spares and Accessories

This appendix provides complete Subscriber Station products, accessories and cable details for various PacketMax installation requirements.

C.1 PacketMax 120/320 CPEs, Cables and Spares

The last two digits in the CPEs part number "-XX" specifies the power cord option where XX is equal to:

- ❖ 01 = North AM, EU, and UK Pwr Cord Option
- ❖ 05 = AUST Pwr Cord Option
- ❖ 06 = South Africa and India Pwr Cord Option



3.1.1 PacketMax 120/320 CPEs

Table C-1 *PacketMax 120/320 Subscriber Stations ODUs*

PacketMax	Part Number	Product Description
PM 120	PM120-5G-20-01	PM120 Subscriber Unit, 5.150-5.925, 20 dbi, US, UK, EU Pwr Cord Option
	PM120-5G-24-01	PM120 Subscriber Unit, 5.150-5.925, 24 dbi, US, UK, EU Pwr Cord Option
	PM120-5G-N-01	PM120 Subscriber Unit, 5.150-5.925, N Type, US, UK, EU Pwr Cord Option
	PM120-3G-17-01	PM120 Subscriber Unit, 3.3-3.8 GHz, 17dBi, US, UK, EU Pwr Cord Option
	PM120-3G-20-01	PM120 3.3-3.8 GHz, 20 dBi, US, UK, EU Pwr Cord Option
	PM120-3G-N-01	PM120 Subscriber Unit, 3.3-3.8 GHz, N Type, US, UK, EU Pwr Cord Option
PM 320	PM320-3G-17-01	PM320 Subscriber Unit, 3.3-3.8 GHz, 17dBi, US, UK, EU Pwr Cord Option
	PM320-3G-20-01	PM320 Subscriber Unit, 3.3-3.8 GHz, 20 dBi, US, UK, EU Pwr Cord Option
	PM320-3G-N-01	PM320 Subscriber Unit, 3.3-3.8 GHz, N Type, US, UK, EU Pwr Cord Option
	PM320-5G-20-01	PM320 Subscriber Unit, 5.150-5.925, 20 dbi, US, UK, EU Pwr Cord Option
	PM320-5G-24-01	PM320 Subscriber Unit, 5.150-5.925, 24 dbi, US, UK, EU Pwr Cord Option
	PM320-5G-N-01	PM320 Subscriber Unit, 5.150-5.925, N Type, US, UK, EU Pwr Cord Option

3.1.2 PacketMax 120 Cables

Aperto recommends these cables to ensure IP67 weather protection for PM120 and PM320 series

Table C-2 *PacketMax 120 Weather Proof Ethernet Cable*

Part Number	Product Description
IP67 Weather Proof, UV protected 50ft Ethernet Cable	PM-IP67-CABLE-50
IP67 Weather Proof, UV protected 100ft Ethernet Cable	PM-IP67-CABLE-100 AND PM-IP67-CABLE-300
IP67 Weather Proof, UV protected 250ft Ethernet Cable	PM-IP67-CABLE-250

3.1.3 PacketMAX 120/320 Spares

Table C-3 *PM 120/320 Spares*

Part Number	Product Description
PW-120-UNIV-PWR-01	PM120/PM320 Universal Power Adapter (US, UK, EU Snap In Plugs)
PA-120-PWRU-05	PM120/PM320 AU Snap In Plug for Universal Power Adapter
PA-120-PWRU-06	PM120/PM320 SA Snap In Plug for Universal Power Adapter
PA-120-MOUNT-POLE	PM120/PM320 Pole Mounting kit
PA-120-POE	Power over Ethernet Injector for PM120 and PM320 CPE
PA-120-GASKET	PM120/PM320 Boot Gasket
PA-120-CONNECTOR	PM120/PM320 Weatherproof Housing/Connector assembly



D

Virtual Local Area Network

This chapter provides the Virtual Local Area Network connection on Subscriber Station, its use and examples of user scenarios.

This chapter covers the following topics:

- ◆ Bridge and VLAN Mode
- ◆ Out of band Management with Management VLAN
- ◆ Inband Management with Management VLAN
- ◆ VLAN Classifiers
- ◆ VLAN Application Example
- ◆ Looping Prevention
- ◆ Behavior of SS VLAN

D.1 Bridge and VLAN Mode

PacketMax products may be deployed in following modes of operation:

- ❖ Bridge Mode: In the bridge mode, data and management traffic is forwarded.
- ❖ VLAN Mode: Virtual Local Area Networks (VLANs) is a method that allows network administrators to create logical broadcast domains, which implies division of local area network by software rather than using cables. The broadcast domains can span across one switch or multiple switches. Thus VLANs:
 - Reduces the size of broadcast domains
 - Reduces network traffic
 - Increases Network security
 - Reduces the need to create subnetworks
 - Enables network to be logically separated and not physically.

For the Data Traffic in the VLAN Mode, the VLAN IDs are configured when provisioning SS using EMS.

D.2 Out of band Management with Management VLAN

Out of band Management traffic adds security, when the management VLAN is enabled. The outbound management is tagged with this VLAN ID. Both BS and SSs should use same VLAN ID as Management VLAN ID. For example, if VLAN ID number is 1 on BS, it has to be the same (VLAN ID 1) on SS as well. The management VLAN ID needs to be set:

- ❖ On the PM5000 BS, manually.



NOTE: Changing Management Port in VLAN requires MSC reboot.

- ❖ On the SS, using the HTTP Interface.

Please refer to Chapter 6 “Commissioning the Base Station”, for setting up Management VLAN ID on the BS and refer to the Specifying Network Setup Settings for setting up the Management VLAN ID on the SS.

Typically management port is used for sending/receiving management traffic (Ping/TFTP/DHCP packets from/to BS or SS). Figure D-1 displays DHCP/TFTP over management port (a management interface set-up).

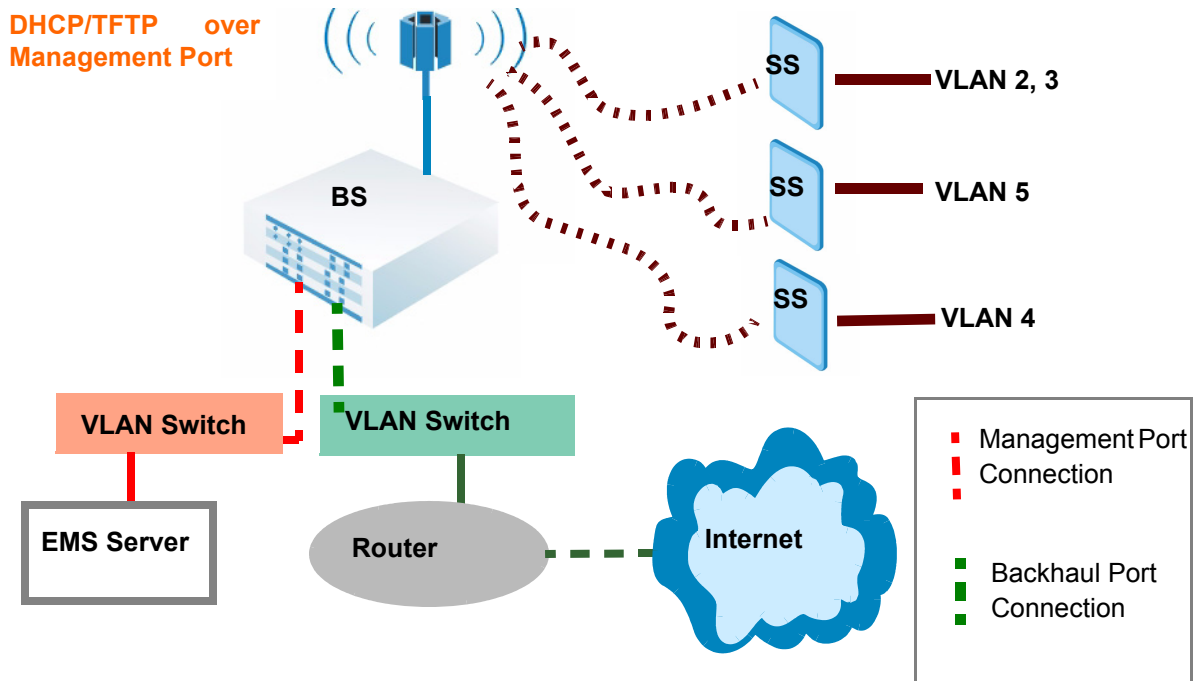


Figure D-1 Out of band Management

D.3 Inband Management with Management VLAN

The data/traffic are segmented by traffic VLANs and is implemented by the backhaul ports (**Inband management**). This VLAN carries inbound traffic.

The Backhaul Interface can be either Fast Ethernet or Gigabit interfaces. Backhaul port could be used for sending/receiving data traffic. Figure D-2 displays DHCP/TFTP over backhaul port (a backhaul interface set-up).



NOTE: There are a few scenarios in which Base Station and Subscriber Station behave and this depends on the mode they are in. In Bridge mode, Management VLAN ID should not be set. In VLAN mode, Management VLAN ID should be set.

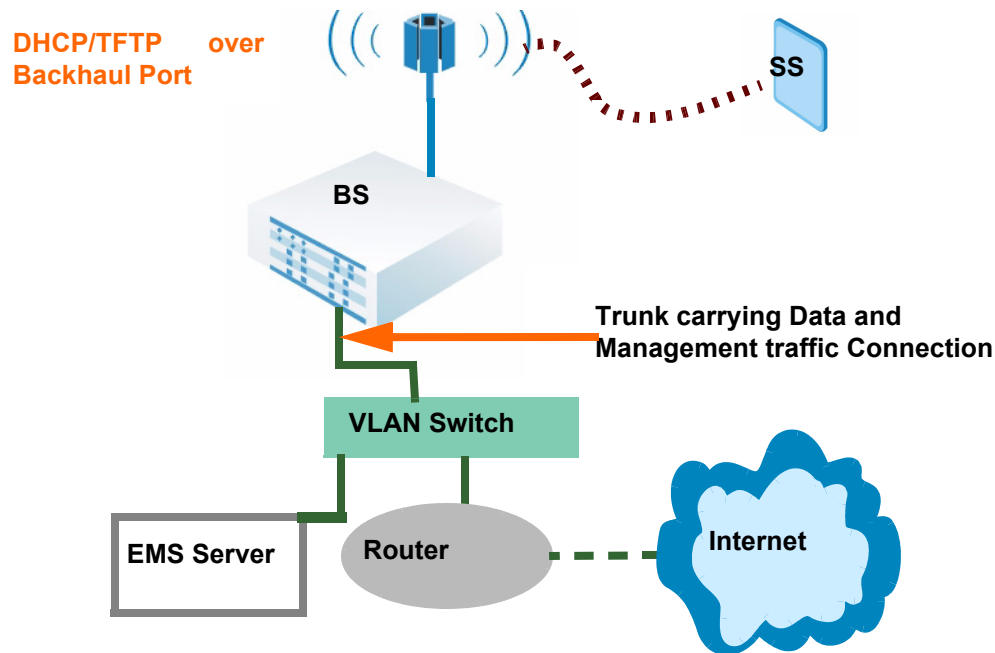


Figure D-2 Inband Management

It is recommended to connect EMS server and Base station unit in the same VLAN, for the ease of management and quick troubleshooting incase of any failures.

D.4 VLAN Classifiers

The VLAN switch identifies traffic corresponding to each LAN interface by attaching a VLAN tag to the Ethernet frame as the traffic is switched to its WAN interface. The Ethernet switch provides isolation of one customer LAN traffic from another customer. As each customer's traffic can be identified with a VLAN ID, it can be mapped onto an individual Service Flow enabling individualized QoS on a per customer basis.

A VLAN Classifier is a set of rules that determine how the PM 120/PM 320 assigns a VLAN ID and priority to a packet based on a wide range of packet parameters such as:

- ❖ Source or destination IP address(es).
- ❖ Source or destination MAC address(es).
- ❖ IP TOS.

❖ TCP/UDP Port numbers.



NOTE: VLAN classifiers are applied only when the unit is configured with them enabled. This is configured in EMS, and is described in the WaveCenter EMS User manual.



NOTE: IP addresses used for VLAN classifiers do not warn the user when the resulting address is the broadcast or network address.

D.5 VLAN Application Example

An example (Figure D-3) using the Point-to-Multipoint PacketMax 5000 Product with two SSs (Subscriber Station) and a Cisco 2950 Series VLAN switch is described in this section.

- ❖ The Base Station Backhaul Fast Ethernet Port is Trunked, via the MSC (Main System Controller), to the Cisco 2950 Series VLAN Switch.
- ❖ Two ports on Cisco VLAN Switch are configured in Access mode to tag all incoming packets. The first port is configured with VLAN ID 101 and the second VLAN ID 102; these ports are used to connect non VLAN enable devices.
- ❖ Two PacketMax SSs are configured in VLAN mode to tag all incoming packets to the BS. One SS is configured to tag all incoming packets with ID 101 and the other with ID 102.
- ❖ The PacketMax products (MSC and SS) are configured to be managed using VLAN ID 100. Hence, another Port on the VLAN switch is configured to tag all packets coming from the EMS Server with VLAN ID 100 to the Base Station Management interface on the MSC.

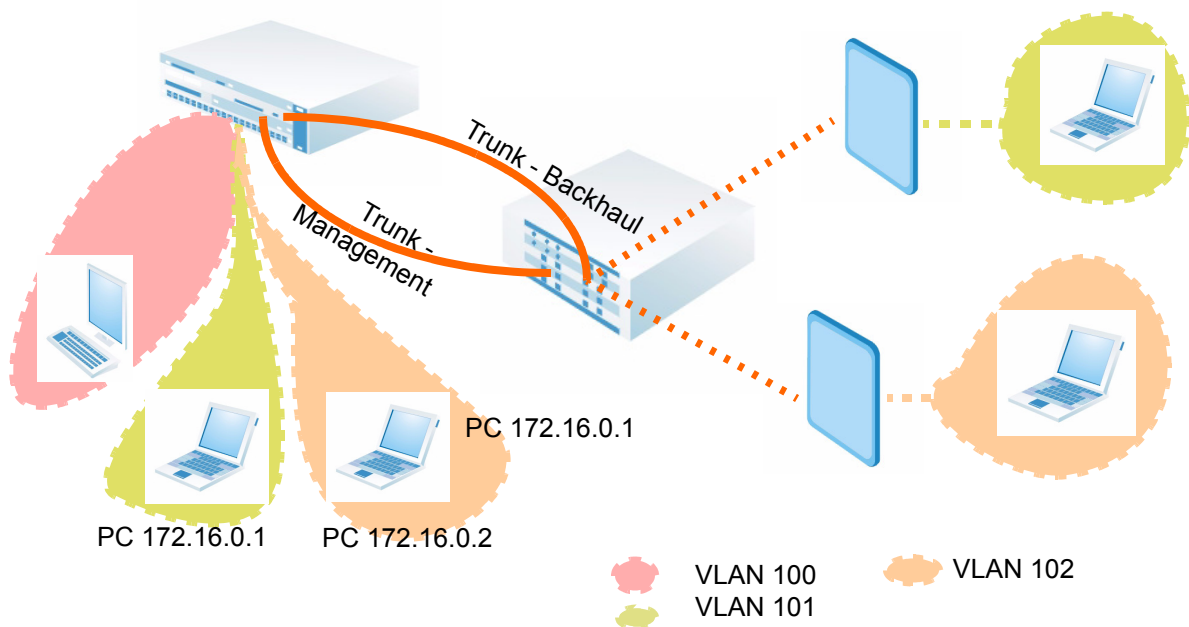


Figure D-3 VLAN Application

D.6 Looping Prevention

The communication between SS and PM 5000 and the communication between SS and EMS server occurs over the management VLAN. The management traffic destined to EMS server from SS is sent out only on management port of PM5000 and it will not be sent out of backhaul port.

Also, if backhaul port receives any management traffic, it will drop it. Hence, if you try to ping PM5000 (which is in VLAN Mode) using management VLAN ID through backhaul, it will not work. Ping will work if it is tagged with appropriate management VLAN ID and it is sent through management port.



NOTE: Base Station Unit and Subscriber Stations need to be configured in the VLAN Mode to avoid any configuration issues. It is not recommended to run the base station in the Bridge Mode and Subscriber station in the VLAN Mode. However, this combination might work but Aperto do not guarantee and Aperto does not support in this mode.

D.7 Behavior of SS VLAN

The following tables have depicted a matrix of the behavior of SS VLAN particularly from LAN, under different cases:

Case 1 : When Network Management VLAN ID is equal to "0" and all Packets are allowed.

Case 2: When Network Management VLAN ID is not equal to "0" and all Packets are allowed.

Case 3: When Network Management VLAN ID is "0" and only Tagged Packets are allowed.

Case 4: When Network Management VLAN ID is not equal to "0" and only Tagged Packets are allowed.

Table D-1 SS VLAN on LAN side for Packet Traffic

S.No	FROM LAN	Case 1	Case 2	Case 3	Case 4
1	Tagged Packet (Configured VlanId)	Allowed	Allowed	Allowed	Allowed
2	Tagged Packet (Not Configured VlanId)	Dropped	Dropped	Dropped	Dropped
3	Tagged Packet (with NM VlanId)	Allowed (Untagged)	Dropped	Dropped (Untagged)	Dropped
4	Untagged Packet		Allowed		Dropped

Table D-2 SS VLAN on LAN side for Ping

S.No	FROM LAN	Case 1	Case 2	Case 3	Case 4
1	Ping Using NM VlanId	Dropped (Ping Reply is dropped at vlanTkOutput of iProEth)	Dropped * (at vlanTkInput of iProEth)	Dropped * (at vlanTkInput of iProEth)	Dropped * (at vlanTkInput of iProEth)
2	Ping Using Untagged Packet		Dropped * (at vlanNmInput-function)		Dropped * (at vlanTkInput of iProEth)



NOTE: “*” implies that Ping Request is dropped.

Table D-3 SS BRIDGE on LAN side for Ping

S.No	FROM LAN	Network Management = 0	Network Management is not “0”
1	Ping Using NM VlanId	Working	Working
2	Ping Using Untagged Packet		Dropped * (at vlanNmInputfunction)



E

Troubleshooting

F.1 Troubleshooting Issues and Tips

Please refer to the following table for symptoms and possible solutions for both the Subscriber Station and Base Station.

SYMPTOM/PROBLEM	WHAT IT MAY MEAN	WHAT TO DO
Subscriber Station		
Subscriber Station is having issues synching up with Base Station	Incorrect Frequency	Check HTTP Configurator has the correct values for all these factors and if they are correct, then check the settings in WSS config file, under EMS.
	Incorrect Channel Width	
	Incorrect BS ID	
	BS wireless port is not operational	
	SS Indoor Unit (PoE) failed to detect the Outdoor Unit	Check if all the cabling is in place.
	The SS is out of range from the BS and is not able to receive any signal from the BS	Check the Base Station Radio connectivity.
SS is not receiving IP address from the EMS server.	The EMS Server may not have the correct reservation for the SS.	Check the MAC address which might be wrong.
	The EMS Server may be not operational.	Check the EMS server on the machine on which it was installed and confirm if the process is running.



SS cannot register all its service flow.	If the number of SSs registering exceeds the number of supported SSs configure in the BS.	Move the SS to another sector.
	If the SS's configuration file specifies a larger number of Classifiers.	Reduce number of Classifiers.
	The SS's configuration file specifies Service Flows for which the BS does not have any reserved bandwidth.	Install more capacity or move the SS to another sector.

F

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